THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXVIII. No. 2168.] LONDON, NOVEMBER 29, 1904. [56TH YEAR. PRICE 6d.

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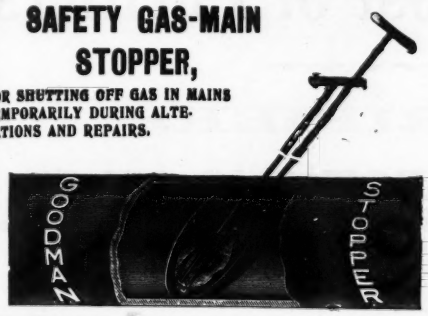

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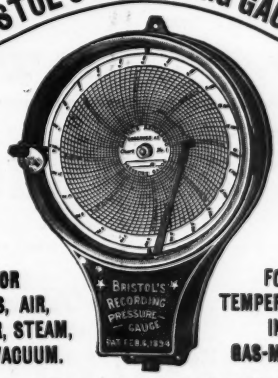

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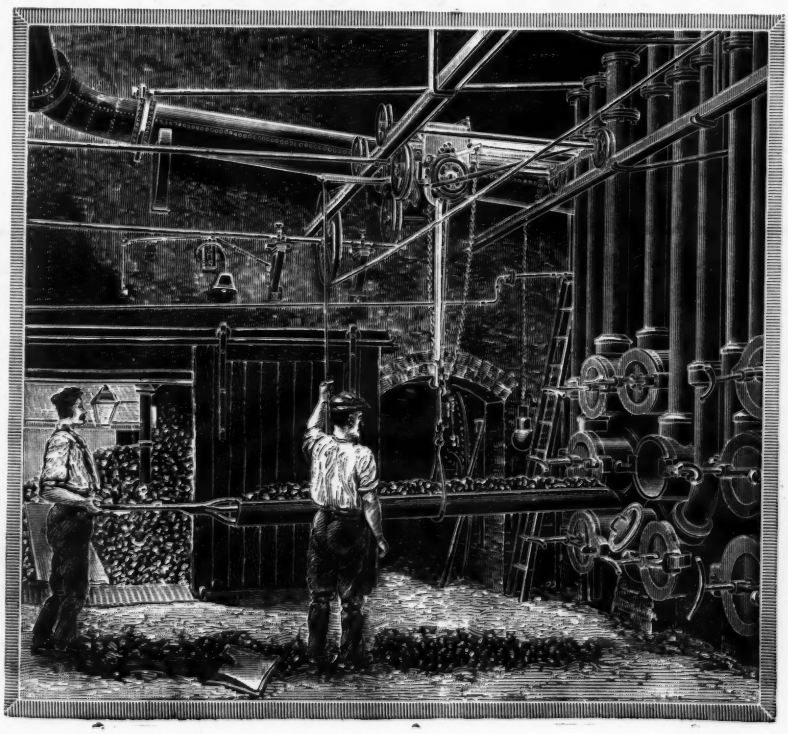

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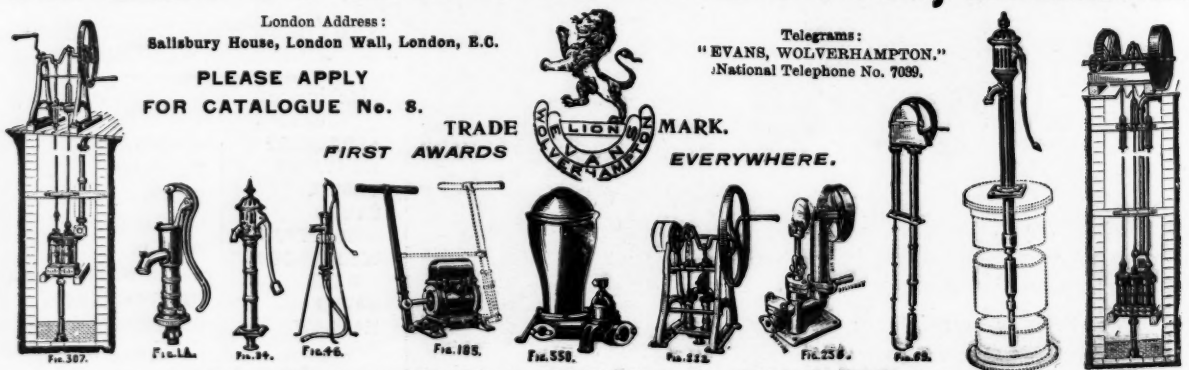

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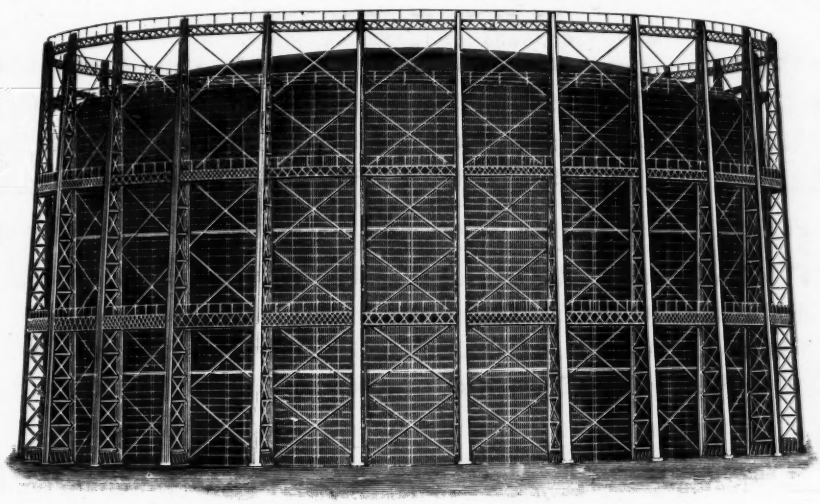

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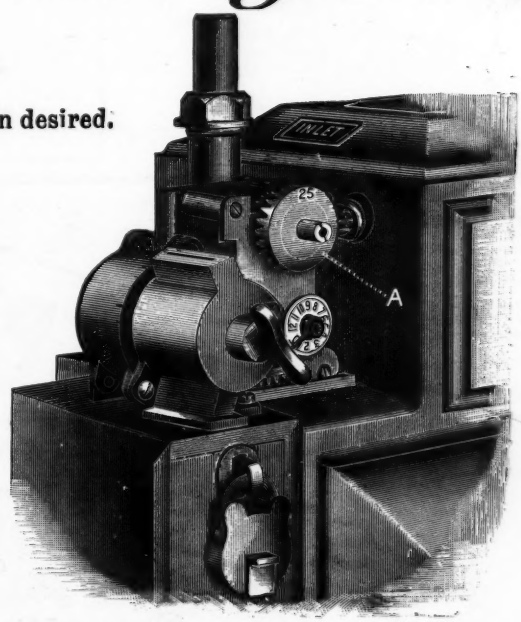

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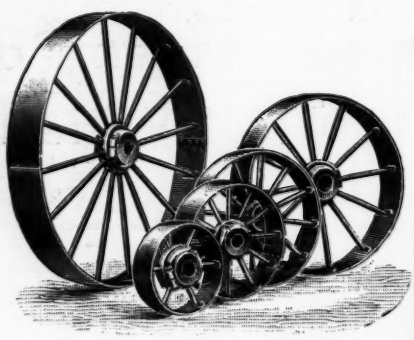

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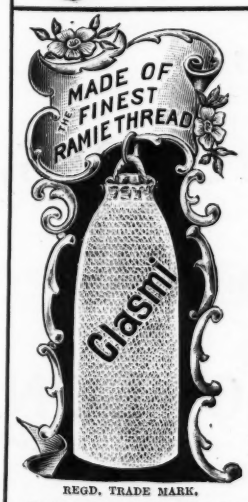

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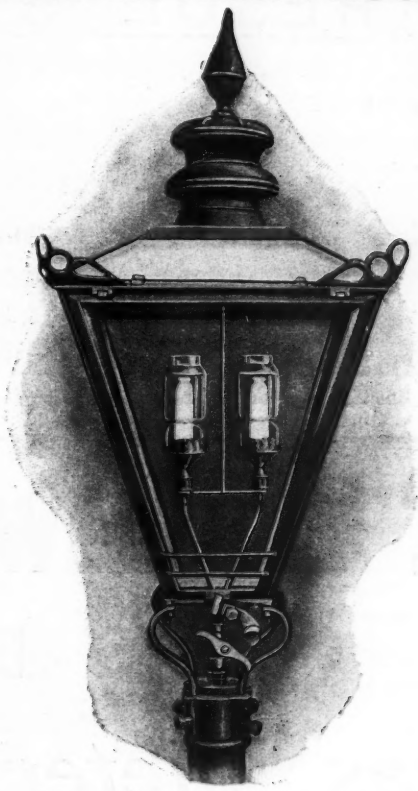
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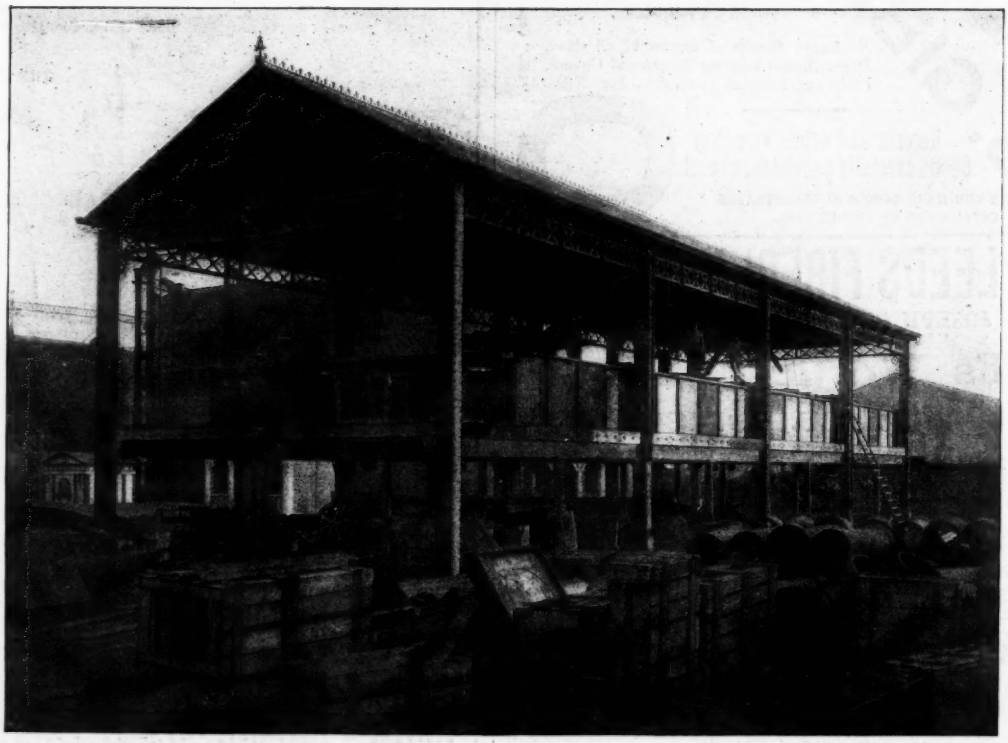

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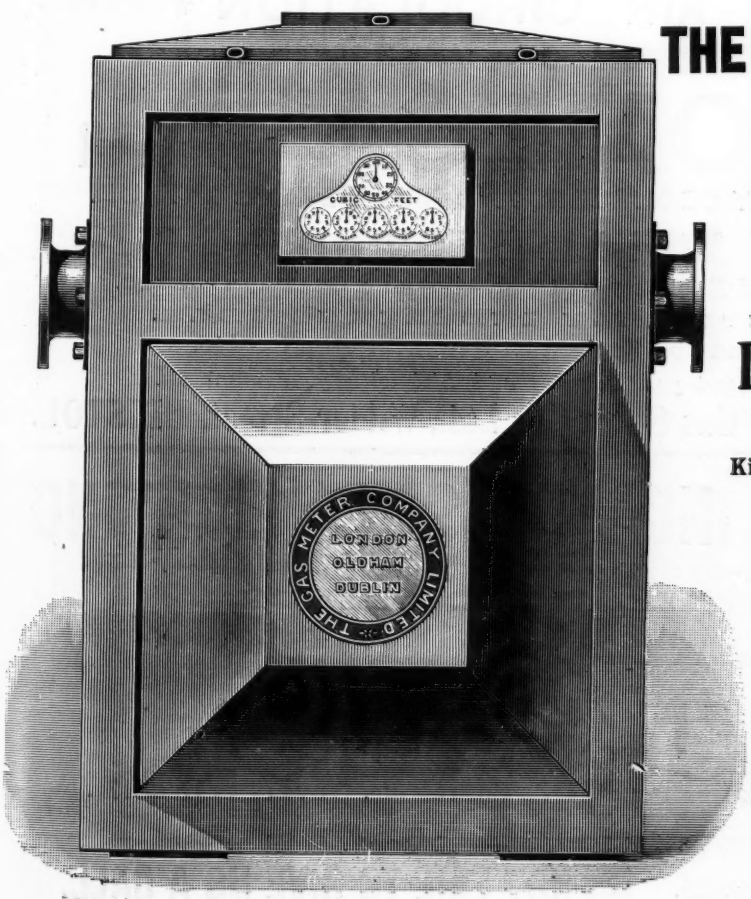

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EDITORIAL NOTES—GAS, &c.

The Gas Exhibition and its Lessons.

THE large attendance at Earl's Court each day since the exhibition was opened, is a practical and sufficient answer to those who believed that a gas exhibition had no interest for the general public; and it must be very gratifying to the management—and, indeed, to all concerned. That it is likely to increase rather than diminish, as the existence of the exhibition becomes more generally known, is almost a certainty. The singularly ineffective poster which is one of the principal means adopted for advertising it (and which has to be searched for to be found) at many of the railway stations which it is supposed to adorn, is perhaps chiefly answerable for the prevailing ignorance as to the display and its whereabouts. Already, however, there is abundant evidence that the old apathy of the public towards gas has given way to an intelligent appreciation of its possibilities. Whether this is due to the great development of incandescent gas lighting, or of the use of gas for heating or motive power, it is difficult to determine. A share may perhaps be apportioned to each. But whatever its source, the curiosity of the public to learn more about gas and the uses to which it may be applied should stimulate all connected with the gas industry—as nothing else can—to even greater exertions, in order that it may worthily fulfil the destiny to which it is undoubtedly called.

The few finishing touches that at the time of the opening were seen to be needed, have since been applied, as regards the interior of the exhibition, which for some days has been complete. It is to be wished that the same could have been said of the outside lighting, the incompleteness of which must have been a disappointment to many of the visitors last week. Generally speaking, however, the exhibitors are to be congratulated upon having shown a degree of preparedness which is not often met with on occasions of this kind, and which it is all the more pleasure to acknowledge, since the task of preparation, at all times great, must to many have been doubly so at this season of the year, when the demand for almost all kinds of gas appliances is at its height.

On entering the exhibition, the first portion that meets the eye is the machinery annexe—not too inviting, it may be remarked, in this inclement weather. This has proved to be none too large to satisfy all the demands for space; and a more ample area could have been fully occupied. It has, however, sufficed for the bringing together of a good representative collection of gas-engines such as are now in general use, and which have added very largely to gas consumption during recent years, more particularly in the manufacturing districts. It was recently remarked in these columns that at the time of the Crystal Palace Gas Exhibition, held in 1882-3, the gas-engine was really only in its infancy. Although the suggested use of gas for motive power dates as far back as the end of the eighteenth century (several patents having been taken out for gas-engines about that time, including one by Philippe Lebon, of gas lighting fame), the history of the gas-engine in this country may for practical purposes be said to date only from the year 1864, when, at the very first meeting of the then British Association of Gas Managers, which was held in Manchester, Mr. Ebenezer Goddard read a paper on the "Application of Gas as a "Motive Power." This consisted chiefly of a description of the Lenoir gas-engine, as made and used in this country; the consumption of which, it is interesting to note, was about 70 cubic feet of gas per horse power per hour, or 210 cubic feet per hour for a 3-horse power engine. This was an explosion engine, without compression. In the year 1867 appeared the Otto and Langen atmospheric engine, which, in an improved form, used only about 21 cubic feet of gas per horse power per hour, and was somewhat extensively employed during the next few years. In this engine, the upward movement of the piston caused by the explosion did not operate on the shaft; the downward movement only was connected to it. This downward movement was caused by vacuum from the condensation of the products of combustion; advantage being taken of the steady pressure of the atmosphere to actuate the shaft. The noisy action of this machine, however, resulting from the alternately violent and slow motion of the piston, was a great disadvantage; and it was to obviate this that, nine years later, the modern Otto engine made its appearance. In this was realized the idea of causing the explosion to expend itself slowly, so as to correspond more nearly with the speed of a steam-engine. This was accomplished by diluting the explosive mixture with a portion of the inert gases resulting from the previous explosion. Scavengering was resorted to at a later period. It is this engine which—operating silently, though scarcely more economically than the Otto and Langen—was gradually coming into use in 1882.

Mr. Dugald Clerk, in his paper on "Gas-Engines," which was read before the Institution of Civil Engineers in 1896, mentions that "in 1881 experiments were made with "a 12 (nominal) horse power engine at the Crystal Palace "Electrical Exhibition, showing a gas consumption of 23·7 "cubic feet per indicated horse power per hour;" and he further mentions that up to the beginning of 1888, the consumption does not appear to have been appreciably altered. At the end of that year, experiments made under the auspices of the Society of Arts, showed a conversion of the heat supplied to the engine into indicated work of 21 per cent.; and this, until 1894, remained as the best result. In that year, according to Mr. Clerk, there was recorded as the performance of an Otto-Crossley engine, an absolute indicated efficiency of 25 per cent., with a gas consumption of only 17 cubic feet of gas per brake horse power. This was with an engine having a 7-inch diameter cylinder, with a 15-inch stroke, giving practically 12 brake horse power. But with a larger engine—namely, one having an 11½-inch diameter cylinder, with 21-inch stroke—a gas consumption of only 13·55 cubic feet per indicated horse power per hour was shown. At the present time, some 16 or 17 cubic feet per indicated horse power may be regarded as a fair working consumption of gas, though it is quite possible to show a lower consumption under specially favourable conditions. It is noticeable that every step in the direction of increased economy of gas consumption has been attended by an increase of gas compression. This has been brought up from about 30 lbs. to from 60 to 100 lbs., and much more in the case of very large engines. It has been made possible, by the substitution of hot-tube igniters for the old slide-valve igniters, and is the main source of the improvement which has taken place in the Otto engine since its original inception. In addition to this, some very effective and simple starting gears have been invented, and extensively applied; while the utmost care has been taken by the makers as regards construction and finish. A very high degree of excellence has thus been attained, and smooth running and durability secured. In this connection, a word may be said in commendation of the makers, who for many years stood almost sole sponsors for the Otto engine in this country—Messrs. Crossley Bros. To the excellence of their design, workmanship, and finish, is due much of the success of the gas-engine. That this should have incited competition by other inventors, is but natural; but the Otto cycle continues to hold the field. It is, however, to be regretted that the Westinghouse Company have been unable to exhibit one of their interesting three-cylinder engines.

A great impetus was given to the gas-engine trade by the expiration of the original Otto patents about the year 1890. This caused a considerable reduction of prices, and brought other manufacturers into the field; so that, whereas in 1882 buyers had practically no choice, now they have abundance. This has contributed largely to the present general use of gas-engines. These were first sold in England on a commercial scale in 1877. At the time of the Crystal Palace Gas Exhibition five years later (in 1882), about 8000 Otto gas-engines were in use in this country and on the Continent; the largest being of 100 indicated horse power. It was estimated by the late Mr. Bryan Donkin, from particulars furnished to him by various makers of these engines,

that at the end of 1897 the total number in use here and on the Continent was not far short of 60,000, which is an increase in the fifteen years that had elapsed since 1882, of seven-and-a-half times. The largest of these was of 160 indicated horse power. The late Mr. William Foulis, in 1901, estimated that the number of gas-engines made and sold in this country alone was between 6000 and 7000 per annum. Adopting the smaller of these two figures, and allowing for a corresponding growth on the Continent, a present total is arrived at of fully 120,000, or fifteen times the numbers of 1882. The great importance to gas undertakings of this huge growth is obvious; and but little surprise need be felt at the opposition excited by the proposal to distribute Mond gas for power purposes. There is, in all districts served by a gas undertaking, a supply of "power" gas available to every consumer; and only the question of price stands in the way of its universal employment. This, however, is being satisfactorily dealt with by the adoption of differential prices; and, if there ever was room for a separate distributed supply of heating or power gas, there is now less room than ever. Gas makers may have more to fear in the immediate future from "suction" producers, which threaten competition for the supply to engines of moderate power.

A noticeable feature of the exhibition is the large number of gas-engines shown with dynamos coupled to them. In the earlier days of this engine, objection was taken to its employment for driving dynamos on the ground of unsteady running; but this has long since been entirely overcome. If we remember aright, it was the late Mr. Denny Lane who first pointed out the economy of distributing electricity by means of gas-engines placed in various parts of a district, over distribution in the usual way from a central station. In the same way, there is economy in generating electricity on the premises by means of a gas-engine, over a town supply of current; and thus electricians may be beaten on their own ground. Should a consumer desire the electric light, a gas-engine and dynamo will provide it for him at from one-fourth to one-half the cost of a town supply; and it does not matter greatly to the gas undertaking whether gas be consumed for lighting or for motive power. The consumer will always gratify his fancy if he is able to do so, and there can be no reason why this gratification should not inure to the benefit of the gas undertaking; no effort, however, being spared, which can be reasonably applied, to prove to him what is undoubtedly the fact—the superiority of gas over electric lighting.

Gas Legislation for the Metropolis.

THE London County Council, it seems, have not thought better of their intention to promote gas legislation on their own account. In last Friday's "London Gazette" appeared a possibly belated notice, the full text of which is given elsewhere, of their intention to apply for leave to introduce a Bill for the purpose of amending or modifying certain provisions of the Gaslight and Coke, South Metropolitan Gas, and Commercial Gas Companies' Acts with respect to the illuminating power and purity and mode of testing gas supplied by those three Companies, and to prescribe the burners to be used, and the mode in which such burners are to be employed, for testing such gas; to define, reduce, or alter, the illuminating power, or the description or definition of the illuminating power or quality of the gas supply; to declare how such illuminating power shall be measured or ascertained; to enable the Gas Referees to prescribe tests, and the Gas Examiners to test for calorific power, the presence and extent of sulphur impurities (other than sulphuretted hydrogen), and the illuminating power in a flat-flame burner; to provide for recording the results of such testings, and to exempt and relieve the Companies from forfeitures under the Acts in respect of them or some of them, to such extent, and for such period and subject to such conditions, as the Board of Trade may determine; to repeal or amend some of the existing provisions relating to the testing for sulphuretted hydrogen, and to make other provisions with respect to such testing; to relieve the Council and any other testing authority under the Act of 1880, from any obligation to test on Sunday, and to make other provisions with reference thereto; to make provision with regard to service-pipes to testing-places, to make further provision for securing the due performance by the Companies of their obligations with respect to illuminating power and purity, and to enforce against the Companies respectively compliance with the provisions of the Acts and of the intended Act; to provide for the better enforcement of the provisions of the Acts and of notifications, prescriptions, and certificates of the Gas Referees; to alter, amend, or repeal all or some of the provisions as to standard price and sliding-scale of dividend, and the variation of dividend according to the increase or decrease of price above or below such standard price, and to make new provisions with respect to any of those; to provide for appeals to be made to the Chief Gas Examiner, and for the determination by the latter in some cases (in lieu of a Petty Sessional Court), of the amount of forfeiture to be paid in any default under the Acts, and for the recovery and application of forfeitures so determined; to repeal or amend section 18 of the Act of 1880, and to make other and further provision with respect to the liability of the Gas Companies to forfeitures under the Act, and as to the evidence of such liability and as to the mode and time of enforcing and recovering such forfeitures; and to provide for the settlement by the Chief Gas Examiner of differences arising between any of the Gas Companies and the Gas Referees.

Whatever else may be thought of this notice, full credit will be given to it for its comprehensiveness. It seems to completely cover the ground occupied by the recommendations of the Departmental Committee of the Board of Trade; but how much further than these several recommendations the London County Council may in some directions be desirous of going, cannot be inferred from the notice, and will not be known until the Bill makes its appearance. A curious inconsistency is apparent in the dealings of this body with gas legislation. In 1900, they fought "tooth and nail" the reduction of illuminating power proposed by the South Metropolitan Company. Yet they were to be found only a short time afterwards proposing a similar reduction for the Gaslight and Coke Company, while at the same time they were opposing with all the power and resources at the disposal of a long purse, the Bill of the Crystal Palace District (now the South Suburban) Gas Company, with particular reference to a suggested reduction of illuminating power. They now intend to apply for powers "to define, reduce, or alter, the illuminating power, or the "description or definition of the illuminating power," of the gas supplied by the three Metropolitan Companies. It would be idle to speculate as to what the terms of this notice may be intended to cover, but one thing seems tolerably clear—that the Council desire to revert to the 5-foot rate of consumption in the testing-burner, and to alter the "description or definition" of the illuminating power accordingly. On the question also of penalty testing for sulphur impurities other than sulphuretted hydrogen, the notice is a conveniently wide one; but it may be inferred that the Council are prepared to throw over their experts—Professor Percy F. Frankland, Dr. Haldane, and others—who have declared their profound conviction as to the injurious effects of such sulphur impurities, provided they can obtain from the Companies a *quid pro quo* in the shape of a revision of the sliding-scale. "What price sulphur?" asked Counsel for the Beckenham Urban District Council during the proceedings on the Crystal Palace District Company's Bill last year. "What price sulphur?" the London County Council seem now to be asking, after all their professed regard for the purity of the gas supply. On other points, also, it is to be noted that the evidence given before the Board of Trade Committee has proved too strong to be resisted. Only one of these need be mentioned—namely, that of Sunday testing, from the obligation in respect of which the Council intend to ask relief. No severer condemnation of the Council's own action in this regard could possibly be pronounced, or more scathing denunciation of the insulting remark which was made some time ago by a member of the Council that, without gas testing, Sunday would be a royal day for cheating. Consistency, however, is a virtue which does not trouble the London County Council. In one session of Parliament they are to be found in strenuous opposition to something which in the following session they are as likely as not to advocate. Anything, apparently, so that they can keep a finger in the pie.

Meetings of District Associations at Earl's Court.

THE first of a series of meetings of District Associations arranged to be held at Earl's Court during the continuance of the Gas Exhibition, took place on Thursday last, when the Southern District Association appropriately led off with a

record attendance of its members. The principal object of holding the gathering there was doubtless to afford the members an opportunity of inspecting the exhibition; but important formal business had to be transacted in the shape of the election of office-bearers for the ensuing year. This resulted in the selection of Mr. S. Carpenter, of Dorking, for the office of President; and no better choice could have been made. Mr. Carpenter, although not in charge of a very large works, has shown a zeal for his profession which is well worthy of imitation; and under his guidance the Association may look forward with confidence to a successful year. For Vice-President, Mr. F. W. Cross, of Lea Bridge, was chosen; and here again the selection was a happy one —Mr. Cross having distinguished himself by the energy he has displayed in the competition of his Company with our friend the enemy—the electric light. The re-election of Mr. James W. Helps to the office of Honorary Secretary, which he has filled with such conspicuous success for many years, was accompanied by an announcement which—while not unexpected, having regard to the large demands upon Mr. Helps' time and services—will be received with great and general regret. His final retirement from that office at the close of another year will be a severance of no ordinary kind, so closely has he been identified with the growth and success of the Association.

The formal business over, the meeting proceeded to consider a very important report from the Naphthalene Sub-Committee. This appears in our account of the proceedings; and, as will be seen by reference to it, it is a summary of the work already carried out, and concludes with a suggestion as to its further prosecution. It is not easy to summarize this admirable report, which, it is to be hoped, will be read by everyone. The whole gas industry is desirous of putting an end to a nuisance which has done much to interfere with the progress of gas consumption. It is all very well to induce consumers to employ gas fires and gas cookers; but the greater their reliance upon gas, the more annoying it is to them to find the supply suddenly cut off without warning, and without hope of remedy until the arrival of the service cleaner. The report derives all the more interest just at the present time from the recent somewhat animated discussion upon various remedies for naphthalene deposits which are in successful use in different places. It does full justice to those who have investigated the subject from a somewhat different standpoint from that which has been taken by the Committee; and it is freely acknowledged that the results obtained by these have always been placed at the disposal of the latter. These results, however, have been attained by subjecting the gas to special treatment at some point subsequent to the condensers; whereas the Committee aim at ascertaining how to arrange the condensing system itself so as to overcome the difficulty, and by means that may be generally applicable. In other words, the object the Committee have in view is to devise a method by which the gas shall be completely and automatically deprived of naphthalene by the time it leaves the condensers; or, failing such complete removal, that the gas shall always contain a sufficient quantity of vapours of substances other than naphthalene which are liquid at ordinary temperatures, and would therefore separate out together with the naphthalene in such quantity that the product would be a liquid and not a solid.

This does not necessarily presuppose that there is in the gas itself, as it issues from the retorts, a sufficiency of solvents for naphthalene for the complete removal of the latter; but such, it may not unreasonably be inferred, is the opinion of the Committee from the evidence now in their possession. And their present object may be defined as being to devise a condensing or cooling arrangement by which gas and tar shall be brought into such intimate contact as, without injury to the illuminating power, may bring into full play the naphthalene solvents contained in the tar. They are, therefore, of opinion that it is desirable to erect such a condenser, large enough to represent the conditions of ordinary manufacture, at one of the works in which their experiments have hitherto been conducted, and where the trouble from naphthalene is great. This view deserves, as it will doubtless receive, hearty commendation; for, obviously, a system of condensation that will remove the trouble must be preferable to any washing process with hydrocarbons, whether specially prepared or otherwise. The idea of the Committee cannot, however, be carried out without cost; and to defray this, further funds are to be appealed for, through the various District Associations. It is to be hoped that this appeal will be liberally responded to by the gas undertakings for whose benefit this important work is being carried on. It is, as has already been said, a matter in which the whole gas industry is interested; and no question of insufficient funds ought now to stand in the way of its successful conclusion. The goal appears to be in sight; all honour to the Southern District Association and their supporters if they reach it. There is, of course, a further matter in connection with this subject, which equally deserves investigation—namely, the conditions of carbonization which conduce to the formation of naphthalene. Whether or not these are attended with the obtaining of the best carbonizing results, is a question which, it is to be hoped, will equally engage the attention of the Committee.

"Hands across the seas" was the message of the letter from Dr. Harrop, the Chairman of the Board of Revision of the Ohio Gaslight Association, the object of which is to enlist the co-operation of the Association in the work which is engaging the attention of our Transatlantic brethren—namely, the revision of the questions and answers in all matters relating to gas manufacture that have passed through their question-box during the past few years, and putting these into book form. Of this work doubtless more will be heard before long.

Another District Association—the Midland—held a very successful meeting at Earl's Court last Saturday. The proceedings were of a formal character, resulting in the election of Mr. Thomas Berridge as President for the ensuing year. This will be hailed with satisfaction by the numerous friends of Mr. Berridge, who realize his sterling worth, the excellence of his work at Leamington, and his zeal for the Association. It is a fortunate choice. Mr. Fletcher Stevenson, of Coventry, succeeds to the office of Vice-President. Mr. Stevenson's unassuming modesty has gained for him many friends; and, combined with his well-recognized professional ability, it makes this choice a decidedly popular one. The members of the Association will look forward with pleasurable anticipation to viewing the new works which he is constructing at Coventry. A notable visitor at this meeting was the President of the Institution of Gas Engineers (Mr. Irving), who spoke a few well-chosen words of "encouragement" to the members, although, as he remarked, there was no sign of depression among them. On the motion of the President-Elect (Mr. Berridge), seconded by Mr. Charles Hunt, a vote of condolence with Sir George Livesey on his recent illness, and congratulation on his happy recovery, was unanimously adopted.

Manchester District Institution Meeting—Mr. Newbigging's and Other Papers.

THE members of the Manchester District Institution of Gas Engineers had a full afternoon's work on Saturday; the greater part of it being spent in pulling up the arrears of debate from the February meeting. We have constantly deplored the loss that is suffered by the postponement of the consideration of technical fare; and the brevity of the discussion on both Mr. J. G. Newbigging's paper on "Horizontal *v.* Inclined Retort Installations, with Notes on Coke Conveying," and that by Mr. H. Kendrick, entitled "Notes on Carburetted Water Gas Working," showed the emasculating influence of delay. In the case of Mr. Newbigging's paper, it may be that Mr. J. C. Belton and Mr. Tim Duxbury had in February so well detected both the superficial and underlying weaknesses of the subject-matter of the contribution that the members considered that to further discuss it to any length would be but "vain repetition," and forsooth additional "much speaking" was not required to impress the points of the critics. On this occasion, however, if there was any loss of discussion through the adjournment, it must be agreed, when the profit and loss account is made up, that there was counterbalancing gain through the delay enabling the authors of the papers to make some excellent supplementary statements, and in the case of Mr. Newbigging to deal with the criticisms in a manner which the best of rhetoricians would have been incapable of doing extemporaneously. The experience on this occasion rather forcibly suggests that an amendment of present custom might well be made, by allowing readers of papers to have the right of submitting their replies in writing through the Technical Press or at the succeeding meeting of the members. This

would enable the author to give to the criticisms that deliberation which would make his answer of far more value than the replies which, owing to the attention being riveted on the running comments, are frequently now—reeled off on the spur of the moment—of a rambling and altogether inadequate character.

Mr. Newbigging's reply to his critics was a straightforward and impartial one; and no one can impeach his honesty or courtesy. One thing is strikingly plain in connection with this question of inclined and horizontal retort working at Manchester. It is that no one recognizes better than Mr. Newbigging the weaknesses and the strength of the great manufacturing works which he has under his charge. Yet with the weaknesses, the final financial costs and results are, as Mr. Newbigging is able to show, of an eminently satisfactory character; and there is no gainsaying this, that, if the weaknesses could be eradicated, the Manchester gas undertaking would stand second to none in its working costs and results. The paper had for its original intention to place before the members of the Manchester Institution a comparison of the author's experiences at Manchester with inclined retort construction and working, as compared with horizontal retorts and power machinery; and, in doing this, he made certain revelations as to the conditions under which Manchester works which lift consideration of his paper on to an altogether different plane from the general one as to which system of carbonization is the preferable—inclined retorts or horizontal ones—under ordinary and equable circumstances. In effect, the choice as between one system and the other in Manchester resolves itself, in our view, into a question of expediency, under the conditions existing there. But no one—an engineer is not likely to fall into the error—must take the figures given in Mr. Newbigging's paper as affording any basis for general comparison as between the one system and the other; for the simple reason that, under Manchester working, the labour on the power machinery in the horizontal retort-houses is extravagant and unnecessary. If it were not so, the case for inclined retorts in Manchester would—by the curtailment of labour in the horizontal working to normal conditions—be correspondingly impaired. That is the position. The conditions of labour and the rates of pay are admittedly excessive; and herein is the weakness of the manufacturing operations which vitiates the value of Mr. Newbigging's contribution to the general question, and its usefulness as a guide to others in considering the matter in the light of their own (we will suppose) more favourable environment.

The weakness, however, is a powerful one; and it has become so by long growth. And the tendency of municipal government (to this no one can be blind) is to foster the spread of that growth. But though it is a retarding factor in the economy of Manchester gas manufacture, there was no word of congratulation, at the Manchester Institution meeting, to the Engineer and the present Gas Committee of the Corporation, on their position in working costs as measured by the usual standards. The point which the Gas Committee and their Engineer obviously have had to consider is, how they can best bring about a reduction of their weakness. There is a stage in some diseases where they are, even by the most favourable and drastic treatment, beyond an immediate and complete eradication; and it may only be by the overthrow, in part or in whole, of existing conditions, that the treacherous influence of those diseases can be prevented, or at all events circumscribed, in the future. Therefore, although the initial cost of new systems may be rather more than old, and there may be other small disadvantages in comparison, withal the local conditions may be such that the extra first expense of making the change may mean the gain of an ultimate economy and relief from tyranny. It is easy to advocate the violent uprooting of pernicious influence of long standing. The advice, if taken, may prove disastrous; and prudence dictates the wisdom of a policy of gradually detaching the associations of that influence. A continuance of things as they exist means, there seems little help for it, their perpetuation; and the cost of labour would not decrease by the increasing business. On the other hand, by spreading present labour over new conditions as increase of business and the depreciation of plant allow, an economy in labour, and its approximation with what is customary, from whatever standard it is regarded, may be expected to result. This is the point of view from which we prefer to examine the question of inclined retort and horizontal retort work in Manchester. The figures which Mr. Newbigging gave in his paper, taken with the supplementary ones furnished on Saturday, give some insight into the efficiency of the antidote. This may not be the only possible one; but the Manchester Gas Committee and their Engineer are prepared to be judged by the results, if their critics will show their generosity by comparing them with the results of past Manchester working.

The paramount interest of Mr. Newbigging's paper rather overshadowed the informative one by Mr. Kendrick which was also read at the February meeting, and briefly discussed at this. The author it will be remembered championed, with figures drawn from his own working, the cause of carburetted water gas. A third paper was produced by Mr. W. Everitt, of Ilkley; and it has an acceptable freshness about it—dealing with a simple system that he has devised of screening "tar fog" from crude coal gas. The paper has the merit of originality and of a studious consideration of means and effects. But the members evinced a little scepticism over some of the points, and a desire for further information, which no doubt Mr. Everitt will be pleased to submit to them with the fulness which is apparently necessary before belief is assured.

Matters other than technical engaged the attention of the members. Marked by the greatest sorrow, the members silently showed their respect for their departed friend and fellow-member, Mr. Ernest L. Newbigging, and sympathy, deepened by the melancholy circumstances, with his father and brothers. The officers for the ensuing year were elected. Mr. S. Meunier is to succeed Mr. H. Townsend in the presidentship; Mr. J. H. Brearley ascends to the senior vice-presidency, and Mr. W. Prince follows the last-named gentleman in the junior office. Mr. Thomas Newbigging retains the position of Treasurer; and Mr. Kendrick that of Hon. Secretary. The announcement by the President of the result of the ballot elicited a demonstration of the warmest approval.

Naphthalene Removal and Anticipation.

THE revival of the question in these columns of the washing of gas for the removal of naphthalene, has had three good effects. It has brought from Mr. William Young a series of articles of superlative value to those concerned in this subject; it has put our readers in possession of a full knowledge of the claims—operative and proprietary—for the process of Messrs. Young and Glover; and it has brought to us the results of the search that Mr. J. Ferguson Bell has made for published anticipations of the Young and Glover system, in order to dispute their "lordship" and title to royalty. Mr. Bell has no patent for what is known as the Derby system, which is in operation at nine works, and will shortly be so in three more; and it is in defence of those who have put their confidence in his system that he has taken such active part in the present controversy. Mr. Bell is clearly of opinion that no patent so far obtained for the removal of naphthalene is worth the paper it is written upon; and this conclusion is the fruit of his search among the technical treasures which he has found buried between the covers of old volumes of the "JOURNAL." In an article from him published this week, he gives what is, in this connection, a remarkably interesting extract from a letter written by Mr. Lewis Thompson fifty years ago to the "JOURNAL." The whole extract is noteworthy; and the last two or three lines especially so. "If, during the pre-" valence of a middle temperature, naphthalene begins to " show itself, we must" (wrote Mr. Lewis Thompson) "sur-" charge the gas with naphtha vapour, so as to throw down, " even at that temperature, a fluid compound consisting of " naphtha and naphthalene." Here we have enunciated the principles applied in the Derby process; and the publication of that statement of half a century ago, Mr. Bell opines, puts on one side the question of any master-patent claim by Messrs. Young and Glover.

Now, we hold no brief in this matter; and it is our desire to keep quite clear from any expression of opinion which shall have any semblance of pretension to judicial determination in the dispute. But we may, without affecting our independence, ask Mr. Bell and others who may think with him not to deceive themselves by believing that any published suggestion of the kind is sufficient to upset a patent covering its application; or anyone else not to fall into the common and mistaken notion that an unsuccessful invention which may be characteristically an "anticipation"

of a successful one, is not sufficient to overthrow the latter invention or discovery. Although it is simply reprinting what we have already published, it may be useful here to quote the warning words of Mr. Fletcher Moulton, K.C., in an address on "Inventors and Invention"—

> I am happy to say that, when an inventor is modest in his claims, and seeks only to protect that which he has in fact made practically useful, the tendency of the jurisprudence of our country is to pay little heed to antecedent incomplete or useless attempts. I have long contended, and I think it is now settled law in our Courts, that an invention is not made until it has been developed so far that the normal result of its working is success. Uncertainty in result beyond this point means practical uselessness, and as it in fact leaves the field unoccupied for future inventors, so it should do in law; and their fame and their reward should not be lessened by the useless half successes that have preceded them.

We do not imagine that the authority of this eminent patent lawyer will be questioned; but his words may serve as a restraint to hasty conclusion in the matter now specially engaging attention.

Co-Operation with the Ohio Association.

As we have before remarked, there has never been co-operation in any work between American and English gas engineers. The opportunity has now arrived by the British gas organizations participating in the work of the Revision Board of the Ohio Gaslight Association; and it is exceedingly gratifying to us that there is fair prospect of this co-operation becoming an accomplished fact. The work of the Revision Board is simply this: During recent years, through the channel of their Question-Box system, the Ohio Gaslight Association have accumulated a vast store of information from many gas engineers. This information is of varied quality; and the Revision Board have been deputed to sift, revise, and supplement it. In looking through the answers, it was clear to us that, in many respects, there are differences between American and English gas practice and experiences, and several matters upon which riper information can be obtained in this country—particularly in relation to latter-day work in connection with coal carbonization; and the idea was formed that, by co-operation with British gas organizations, the usefulness of the labour of the Revision Board could be extended, and end in the production of a work which would have a world-wide, instead of a limited, value. The Revision Board were of like opinion; and the result has been that Dr. Harrop has addressed communications to the District Associations seeking their co-operation. The Southern Association and the Manchester District Institution have regarded the matter favourably; and as their respective Committees have received full liberty to act in the matter, we should like to submit for consideration another suggestion, in order to put the matter on a working footing as rapidly as possible, in view of the fact that the machinery appointed by the Ohio Association is to an extent stopped in its operation pending the decisions of our own Associations. The suggestion is that a Sub-Committee from the members of each Association, with a Secretary of their own, should be selected to undertake this work, and so relieve the Hon. Secretary and General Committee from the duties attaching to it—reporting progress to the latter, and through them to the Association. Meanwhile, we have consented to a request by Dr. Harrop to receive and forward to the proper quarter any papers received from him before he has replies from the Associations. Thereafter, of course, communications will be made direct to and from the Associations who take part in the work. There is a short communication on the subject from Dr. Harrop on p. 678.

Limited Liability Companies and Voting Powers.

Municipal extremists have gone hysterical over the attempt to remedy a piece of flagrant injustice which has completely deprived limited liability companies of voting power in the matter of representation in municipal affairs. In the eyes of the ultra-municipalists, such companies are, although the largest ratepayers in a district, nothing better than pariahs who have no right to hearing or representation. Suffice it, they say, that in their individual capacity, these people have a vote. But before even a molecule of equity will be discovered in this argument, it necessitates the residence of all stockholders in the municipal area within which the business premises or works of the company are situated. But broad-minded municipalities recognize the injustice, and the effect that it has of divorcing the active interest of the business men associated with such companies from civic affairs. The Municipal Corporations Association are not averse to an amendment of the law in this regard; and the Holborn Borough Council are not blind to the iniquity of the disability of those who are among the heaviest ratepayers in the matter of representation, which is a right of even the smallest occupier. In a return which the Holborn Borough Council have had prepared, it is shown that, in their own area, of the total amount required for defraying their expenses (£341,296), £97,400 is payable in respect of premises in the occupation of limited liability companies, public authorities, &c., in respect of which no name appears on the register of electors—the proportion which this sum bears to the local rate being 28·53 per cent. On the other hand, they find this equally remarkable condition of things, that the number of voters on the list who do not directly pay rates represent no less than 56·03 per cent., yet they have the right of representation. The Council have circulated these figures and their report upon them among the other local authorities of London, with a request that similar returns should be prepared and submitted to the Government, the leaders of the Opposition, and the members of Parliament representing London constituencies. This question of the violation of an old principle in its relation particularly to gas companies, is one to which we have from time to time made incidental allusion; and with the growth of municipal trading, it daily becomes a matter of greater moment. We devoutly hope that the action of those broad-minded municipal bodies who recognize the injustice will bring about the legislation which will enable all limited liability companies to exercise the franchise. It is only those municipal bodies who fear who will oppose.

An Institute of Directors.

Last week there took place the inaugural dinner of the Institute of Directors—an organization which has been formed for the purpose (among other things) of protecting the interests of directors, and of enabling them to carry out the responsibilities they undertake. A glance down the names of those present at the function is enough to satisfy one that the Institute is not doomed to a life of "masterly inactivity;" and we shall therefore expect before long to see it fully engaged in a career of great usefulness. The President is Lord Avebury; and among those who supported him at the dinner were Viscount Hampden, Sir G. Hayter Chubb, Bart., Sir T. Brooke-Hitching, Mr. Felix Schuster, Mr. J. Spencer Phillips, and Mr. Justice Buckley. The latter gentleman, in proposing the toast of "The Institute of Directors," pointed out that in the olden days, when the capital of a firm belonged to the members of it, each man had the government of his own capital, and self-interest was a sufficient preventive against anything like either ruinous speculation or dishonesty. Now, however, they had great undertakings which were entrusted to boards of directors who had a comparatively small stake in the concern; and thus another state of things had come into existence. He thought, therefore, it was for the social good of the community that the persons who had control of these companies should be united in a body whose integrity might be assured. It had, he said, long seemed to him that the gentlemen who accepted the responsibility of conducting the affairs of a large body of shareholders and a great amount of capital ought to receive such a remuneration as would invite into those enterprises persons of integrity, standing, and ability to conduct them. Many people thought that the way to ensure the integrity of a director was to see that he had a large stake in the concern; but in his opinion this was a fallacious view. It did not follow that a wealthy man was the best person to conduct a business, and if a man worked hard for a concern, they must pay him properly for the services he rendered. On the other hand, if they adopted the principle upon which he was speaking, let there be an end to the pluralist director; that, in his opinion, was quite wrong. The man who accepted the duty of managing other people's affairs should do it really, and not by way of pretence; and he hoped the class of directors to which he referred would cease to exist. He believed that the profession of a director would be very much improved by the existence of the Institute. Lord Avebury, in responding to the toast, said there were a great

many legislative measures they would like to see carried out, and a great many it would be their duty to oppose. Among the most important functions which the Institute would have to perform would be to maintain the high tone of English commerce. It should not be too much to expect that the Institute will be largely supported by those whom it is created to benefit.

The Handling of Goods at Wharves.

The persons employed in the various processes connected with the moving and handling of goods at docks, wharves, or quays, as well as with the loading, unloading, or coaling of ships in docks, harbours, or canals, ought to perform their arduous duties under much more favourable circumstances in the future than they have done in the past. The article in a recent number of the "JOURNAL," giving details of what has been accomplished by the Surrey Commercial Docks Company, with the assistance of the South Metropolitan Gas Company, at their New Greenland Lock, should have the effect of stimulating a desire to introduce better lighting on many a quay which is at present dangerous. In connection with this matter, attention may be directed to the recent issue by the Home Secretary, in pursuance of powers contained in the Factory and Workshop Act, 1901, of a set of regulations specially framed for the protection of the class of labourers above referred to. They have been drawn up in accordance with the report made by Mr. Chester Jones, the Commissioner appointed for the purpose, after a public inquiry held by him during the present year. They will apply, except where otherwise indicated, to all docks, wharves, and quays (including those which may form part of factory or workshop premises), so far as relates to the processes of loading, unloading, moving, and handling goods; to all machinery and plant used in the processes of loading, unloading, or coaling any ship in any dock, harbour, or canal; and to all persons employed in these processes. The term "ship" has the same meaning as in the Merchant Shipping Act, 1894, and includes every description of vessel (other than ships belonging to the Crown) used in navigation not propelled by oars. The regulations will come into force on Jan. 1, 1905, except so much of them as involves structural alterations, for which a further period of three years is allowed. One of the regulations requires a register to be kept of all chains used in hoisting or lowering. It has to be kept on the premises to which it relates, unless some other place has been approved in writing by the Chief Inspector of Factories. A form of register has been prescribed by the Secretary of State. The regulations are to be fixed on the premises to which they relate, and have been reprinted in placard form for the purpose.

WATER AFFAIRS.

Last of the London Water Awards.

By the publication on Friday of the award of the Court of Arbitration under the Metropolis Water Act, 1902, in the case of the New River Company, the ratepayers of London were made aware of the total amount they would have to pay to the Water Companies for the undertakings which have been transferred to the Water Board. Delay occurred in determining the sum to be awarded to the above-named Company, owing to the peculiar constitution of the concern. In addition to their water business, they possessed landed estate; and although the Act of 1902 contained a special provision that the undertaking to be acquired was not to include any "landed estate, houses, or property not directly "used for, or connected with, their water supply," certain difficulties arose on various matters which had to be settled by appeals to the Courts. At the outset, the Company asked for their property as much water stock as would produce £350,000 a year, assuming a 3 per cent. stock were issued. This worked out to about £11,550,000; and the Board made them the not too liberal offer of £3,800,000.

The hearing of their case by Sir Edward Fry and the two other Arbitrators commenced about a year ago; and it occupied them for several days. Those of our readers who followed the course of the proceedings in this important arbitration will remember that certain points of law in connection therewith had to be determined by the House of Lords; the consequence being that on four of the questions at issue the Arbitrators' decisions were affirmed. The result was that the Company's subsequent claim of £13,260,164, based on the capitalized value of an income of £350,000 a year, was reduced to rather more than £8,000,000, less the value of their Clerkenwell Estate. The Arbitrators then proceeded to satisfy themselves in regard to the matters excepted from the transfer by the provisions of the Act already alluded to; and having learnt that an agreement had been come to by the parties as to certain portions of the Company's offices and furniture included in the exceptions, they settled the amount to be paid for the undertaking. The decision, as announced by their Secretary (Mr. Arthur Paget) on Friday, is that the Water Board are to discharge their liability to the Company by the issue to them of water stock to the amount of £6,534,000, and are to pay their taxed costs in the arbitration as between solicitor and client. In connection with this matter, it may be mentioned that, in a separate arbitration, the Directors of the Company have been awarded by Lord Revelstoke £72,400 compensation for loss of office, or £37,600 less than their claim.

The award to the Company practically completes the work for which the Arbitrators were appointed. They had a heavy task before them; having to adjudicate upon claims amounting to about £47,000,000, to meet which an offer of less than one-fourth of this sum was made. Of course, this was preposterous. On the whole, it must be acknowledged that the Arbitrators have discharged their duties with full appreciation of the rights of the parties in possession and the responsibilities of the Board entrusted with the control, on behalf of the great body of the ratepayers of the Metropolis, of the undertakings of which they had to determine the value. The outcome of their long inquiry has been that the £47,000,000 has been reduced to £30,662,323, the equivalent of which in water stock at £91 6s. 6d. per cent. is £33,575,243. In addition to this, the Water Board will have to bear the debenture charges, amounting to about £300,000 a year. The market value of the undertakings on Dec. 31, 1901, was £21,772,966; at the time of the announcement of the first awards it had increased to £23,892,495.

All things considered, therefore, the Companies have not much reason to complain of the result of the arbitration proceedings. They have come out of them, as they have done out of every inquiry to which they have been subjected—and these have been many and searching—with untarnished reputations as conscientious public servants. If they put what was perhaps not unjustly regarded as an exaggerated value upon their property, they were quite aware of the ability of the representatives of their opponents before the Court of Arbitration to properly direct the attention of its members to this point, as well as of the special qualifications of the latter for appraising it. At the same time, they—or rather the Directors and responsible officials—knew the amount of capital and labour which had been expended in bringing the works into their present condition. The new Board are now in full possession of the water undertakings of the Metropolis. They are gradually concentrating and organizing their staff, and placing it under the supervision of chief officers of tried experience. As we remarked a few weeks ago, too much must not be looked for from them at first; and therefore they have wisely determined not to figure in Parliament next session. It may, however, be confidently expected that one of their first important steps will be in the direction of equalizing the charges for water throughout the limits of their supply; and this should remove at all events one cause of dissatisfaction on the part of many of the consumers. If the change should only give rise to a similar feeling on the part of a section of the remainder, they will have to console themselves with the reflection that the Board are only obeying the injunction of Parliament in this matter, as embodied in the Act constituting them, and endeavouring to act upon the principle of doing the greatest good to the greatest number.

At the meeting of the Metropolitan Water Board last Friday, Mr. WALTER MOON was appointed Law Clerk, at a salary of £500 per annum. There were 130 applicants for the position.

The death took place last Tuesday week of Mr. DANIEL CLARE, who was for many years Manager and Secretary of the Chesham Gas Company. Deceased was in his eightieth year, and was one of the most respected inhabitants of the town.

NOTES FROM EARL'S COURT.

Gas Management and Public Interest.

There is no doubt about the exhibition having "taken on." Right away from the opening day, it is a pleasure to report, the attendance has exceeded the most sanguine expectations of the organizers, who, with the exhibitors, are naturally very delighted. Morning, noon, and night have witnessed a constant incoming into the halls of light and of novelty and educative opportunity and influence; and, during the evenings, the pathways between the stands have been thronged. The general public have been strongly in evidence; and this has belied the prediction that the exhibition would not appeal to any but those directly identified with gas interests. As to the latter, not only on the days particularly devoted to Association visits, but on all others, it has been impossible to be in the exhibition without meeting with gas engineers and managers and others engaged in the control of gas undertakings. Several exhibitors report that they are particularly gratified with the interest taken in their productions; and they fully recognize that the future advantage of this is as valuable as the immediate reward that may be gained in the way of business. Plant and apparatus cannot be conveyed from place to place excepting at a prohibitive expense; and plant, apparatus, and appliances will come within the ken of, and their good and special points be explained to, more gas engineers and managers in the four weeks' run of the exhibition than they could possibly do and be in the ordinary course of business. So it is in the future more than the present that the greater guerdon will be reaped by exhibiting manufacturers. Demand for gas and accessories is bound to receive, through the exhibition, a fillip in public channels; and if this anticipation is realized, the requirements of gas suppliers will be the greater.

A Warning, and Good Examples.

We should like to warn all connected with the industry—engineers, directors, and committees—that if they do not take advantage of visiting the remarkable accumulation of exhibits at Earl's Court before the end of the exhibition, they will have lost an opportunity that may never be theirs in similar degree for many years to come. Remember that it is over twenty years now since the previous large gas exhibition was held; and how many years more will run their course before another exhibition on an equal scale to this one is brought together, we cannot say. It may be five, ten, and who can tell that it will not be even twenty years again? This is a great effort on the part of those concerned, involving enormous labour on the promoters, and expense on the part of the exhibitors. And it is not at all likely that the manufacturers will feel disposed to incur similar expense, or that the Institution and Mr. Helps and his colleagues will care to undertake so herculean a task, for a long time to come. Therefore visit Earl's Court now. Many chairmen, directors, and committeemen have already been to the exhibition; and others have sent their staffs and fitters. The Newcastle, Cambridge, and Harrogate Gas Companies, and the carriage department of the L.N.W.R. (Wolverton) are notable examples. To-day the Chairman (Alderman Gibson) and members of the Manchester Corporation Gas Committee will be among the visitors.

Mr. C. E. Jones writes: As a favour, and in order to lessen the labour of writing to any more inquiring personal friends, acquaintances, and others, could you possibly spare space in your crowded columns for the following: Most earnestly do I recommend all persons directly, remotely, officially, or otherwise, interested in gas, or any other system of lighting, to visit the International Gas Exhibition at Earl's Court. Since Light at the Divine command first flashed through the realms of space, there has been no approach to this object-lesson in artificial illumination and the multitude of purposes to which coal gas has been successfully applied. Educationally, mechanically, chemically, physically, and generally, it is an intellectual banquet, inexhaustible and unique. Directors and Gas Committees, above all, should not miss seeing its many utilitarian wonders, furnishing as it does a complete and convincing answer to the taunt of coal gas being a "moribund industry."

Local Pressmen at the Exhibition.

Last Wednesday, Mr. James W. Helps, the Chairman of the Exhibition Advisory Committee, took several—ten, we believe—Press representatives from Croydon to Earl's Court. They were shown round the exhibition by Mr. Helps, and in the evening had dinner with him. The impression produced upon the journalists by the gigantic display of exhibits and the demonstrations of lighting was one that last Saturday yielded excellent local results for the Croydon Gas Company. There is profit for gas undertakings in the hint.

On this subject, Mr. John Hammond, of Eastbourne, writing last Thursday, says: "I was much impressed by my visit to the Gas Exhibition on Saturday last, and returned with a feeling that, at all cost, the leading tradesmen, shareholders, and all interested in gas should not miss this splendid show of gas appliances for light, heat, and power. My idea was to send the local Press representatives to the exhibition free of cost—in fact, induce them to have a day off, that they might the better be enabled, from personal inspection, to come home and write an interesting and appreciative article that would rouse the active and foremost inhabitants of our town to visit Earl's Court, and see for themselves the progress gas is making in face of the keenest competition. I immediately acted upon the idea; and in sending friends from Eastbourne, I wrote a letter of introduction to Mr. Helps, the Chairman of the Advisory Committee, to do all he could to post these friends with useful and interesting information. Mr. Helps writes to thank me, and wishes me to write you, as the suggestion of each gas manager doing the same in his own locality is a good one, and will probably greatly increase the number of visitors from each town in all parts of the country who might not otherwise be attracted to this unique, interesting, and useful exhibition. The possibilities of cheap gas are, to my mind, very great—in fact, I have my eye on our local electricity works, 500 yards away; and gas being a convertible term for electricity, I hope the time is not far distant when I shall be sending them a cheap gas for producing all the electric current required by the town—thus dispensing with the wasteful steam-engine. Surely it is not too much to hope that gas-works will in the future, in every district of any importance and extent, become the central supply for cheap light, heat, and power; likewise for all kinds of industrial purposes, including motive power for electrical trams, motors, heat, and light." We have had the pleasure of seeing an Eastbourne paper containing a striking little article by one of the pressmen on the subject of the exhibition—the article being one of the results of the enterprise of Mr. Hammond.

"The Working Man's Gas Supply."
(One of the exhibits of the Gaslight and Coke Company—see "Journal" last week, p. 567.)

The Loan Collection.

There is in the left wing of the Ducal Hall, in the space which has on two of its sides the office of the Advisory Committee, the Welcome Club, and the office of the Organizing Managers, a loan collection. As there is not the attraction of brilliant illumination on the stands, it is just likely that the exhibits may pass unobserved by many. But no one should miss them—particularly the South Metropolitan Gas Company's photometer for testing incandescent and other high-power burners, as exhibited by Messrs. Carpenter and Helps before the International Photometrical Committee at Zurich on June 19, 1903. How time flies! The Cambridge Scientific Company's collection of instruments, too, are interesting; and the perfect little models of fires and cooking apparatus which have been lent, and samples of domestic and street lamp lighting fittings from the Continent, enable comparison to be made of style and variations with English manufacture and practice. We need not catalogue the numerous articles. The Paris Gas Company, the Imperial Continental Gas Association, and the German Continental Gas Company, are among the principal of those who have kindly sent contributions to this section. Models of some of the work of the late Mr. Edward Drory in inclined retort installation will have a fascination for those engineers who followed the development of his views and lines of construction in this direction while at Vienna and in later years at Berlin.

The Quick Cookery Competitions.

Next to the Café Chantant, the quick cookery competitions supply the greatest amusement to the public; and they are well patronized. The chief object of these competitions is to display the time and labour saving merits of gas-cooking stoves, rather than the skill of the cooks in dressing food in fancy ways. Each competitor pays an entrance fee of 1s.; and there is no doubt about the keenness of the rivalry of the fair cooks to win the prizes. The first prize is £2, with a first-class certificate of competency, for the best performance each week in each competition; 15s., with a certificate, for the second; and 10s., with a certificate, for the third. Last week there were five competitors; and Mrs. Sutcliffe and Miss Helen Edden were the judges—with Mr. W. H. Y. Webber undertaking the momentous duty of "time-keeper." On the platform is a line of twelve stoves from different well-known makers. The menus are of a simple character—just sufficient to bring out the skill of the competitors. For example, there were breakfast and luncheon competitions last week; and the menus were as follows: Breakfast—"Coffee, boiled milk; savoury omelette; broiled rasher of bacon; poached egg; two pieces of toast; three slices of bread and butter." Luncheon—"Two fillets plaice, fried; two mutton cutlets on bed of mashed potatoes, with tomato sauce; soufflé potatoes; cabinet pudding, with custard round (custard powder); cheese straws." One of the luncheon competitions was witnessed; and the time allowed was 45 minutes. Looking at the menu, there seems to be a lot to do in the time. But the five pairs of deft hands went briskly to work, and, by the aid of the gas-stoves, the competitors all came within the allotted time. The winner of the first place only took 32 minutes; and the last of the competitors finished up in 37½ minutes. So that there was only a difference of 5½ minutes between first and last. The competitors were in the best of humour one with the other; and they testified, by the production of their savoury and delicate dishes, to their own skill and the value of the gas-stoves they were using. An excellent lunch in 32 minutes! What more can be wanted? Visitors to the exhibition can have an amusing and restful half hour here.

Lectures and Demonstrations.

Mr. Webber has assumed the rôle of popular lecturer during the run of the exhibition; and twice each day finds him occupying the platform and the attention of audiences of varying numbers. His lectures are, as it were, sandwiched between quick cookery competitions and the cookery lectures; and they, like the latter, are specially intended for the public ear. Four subjects constitute the series of lectures—one is on "The Cheapest Electric Light;" a second is on "Lights and Lighting;" a third is on "Gas-Cookers and Gas-Fires;" and a fourth on "Factories without Chimneys." The cheapest electric light for large establishments is, of course, provided by a private gas-engine plant. "A gas-engine plant, using gas as and only when required from the town mains is the solution of both the economical and the technical problems indicated by theory and confirmed by practice." In the lecture on lights and lighting, Mr. Webber shows that one cubic foot of gas will give as much light as 80 watts of electricity—that is to say, by the consumption of 1 cubic foot of gas an hour, a light of 20-candle power can be obtained; while to get a light of 20-candle power for an hour by electricity, 80 watts would be required. According to the price of gas, for a penny from 25 to 40 incandescent gas-lamps, each of 20-candle power, can be used; while if 6d. per unit be taken for electricity, 80 watts would cost ½d. Therefore two lamps of this rate of consumption could be had for a penny. This being so, it follows that the lecturer computes that the comparative cost of electricity and gas by these systems is something between 12½ and 20 to 1 in favour of gas. Some useful hints to the uninitiated are found in the lecture on gas-cookers and gas-fires; and the same may be said of the one on factories and chimneys. But we fear that manufacturers do not turn up in great numbers to hear that their smoky chimneys may be dispensed with by the assistance of gas-engines. The cookery lectures are in the capable hands of Mrs. Sutcliffe and Miss Edden; and these ladies demonstrate twice daily with, in turn, the twelve makes of cooking-stoves placed on the platform.

The Gas Supply to the Stands.

The Gaslight and Coke Company and their responsible officials deserve every recognition for the manner in which they laid themselves out to render service to the exhibitors, and to promptly afford relief from difficulties. Several exhibitors have acknowledged their indebtedness. The Company were well up to time with their work at the opening; and when it was found that, though a liberal margin had been allowed on the estimated consumption, the pressure of gas was not quite sufficient in the distant parts of the exhibition, on Tuesday last week, it was, without hesitation, determined to put an additional 6-inch main through the buildings. The main was coupled up on Friday, and much better pressures were at once obtained. The deficiency in pressure was produced by the exhibitors themselves largely exceeding the connections that they had originally intended to make. Another piece of consideration on the part of the Company—which is greatly appreciated—is the reduced charge for the gas used, of 2s. 3d. per 1000 cubic feet. We can almost hear the comments on this, that the consumption of gas must be large; that the exhibition being held in the midst, as it were, of the Company's district, must be of tremendous advantage to them; and therefore it is to their interest to look well after the exhibitors. This is all true; but there are two ways, and many degrees of difference in each, of affording facilities and easing difficulties. It is a satisfaction to learn from exhibitors, and to recognize here, that the officers of the Gaslight and Coke Company directly concerned in the exhibition have rendered of their best in this matter.

Good Fellowship.

One thing that has struck more than one visitor to the exhibition has been the spirit of good fellowship that exists between the managers of the various stands. There have been exhibitions in the past where the spirit of rivalry has been all too evident; and this has not by any means added to the comfort of visitors. The secret of the happy condition of things at Earl's Court is without doubt that the exhibiting firms have recognized the importance of the exhibition, and have put their leading men in charge of the stands.

Shop Window Illumination on the Hidden-Light Principle.

[One of the striking and much-admired exhibits of the Gaslight and Coke Company—see "Journal" last week, p. 567. In the window are displayed samples of the multifarious products obtained from tar, ammoniacal liquor, and cyanogen liquor at the Company's chemical works at Beckton. As mentioned above, the exhibit has the second object of showing one way of efficiently lighting a shop window from the top. On a card in the window, these facts are printed: "The lighting of this window by eighteen incandescent gas-burners, giving over 1100-candle power, costs 2¾d. per hour, including maintenance, and mantles and chimneys, at the Company's usual rate of charge. To obtain the same amount of light by electricity, would involve the consumption of 4⅜ units, and would cost (at only 4d. per unit) 1s. 5¼d. per hour, including the cost of electric lamp renewals].

Association Meetings.

The Southern Association meeting at the exhibition on Thursday was a huge success; and the members came from all parts of the extended territory covered by the organization—making up a party in number without parallel in the register of attendances at the ordinary meetings. On Saturday, again, the falling together of the visit of the Midland Association and the Institution meeting on affiliation brought to the exhibition a large number of gas engineers and managers from all parts of the kingdom—among them being a goodly sprinkling of North British Association members. The pathways were crowded in the early evening; and, so many were the friends that one met, that there appeared to be few strangers about. The North British members to the number of 43 travelled up in special saloon carriages on Friday; and several others—probably about two dozen—arrived subsequently. As mentioned, many of them were at the exhibition on Saturday; but yesterday was the day formally set apart for their visit. They assembled soon after eleven o'clock in the entrance hall; and were soon deeply interested in the moving machinery. But after that they split up into small parties (which

was no doubt a convenience to the exhibitors), and wandered round the stands—staying to inspect just as fancy dictated. The President (Mr. J. Carmichael, of Barrhead) and the Secretary and Treasurer (Mr. R. S. Carlow) were of the party. The return journey to Scotland is to be made to-day—some of the members travelling homewards this morning, and others to-night.

The Press, the Exhibition, and Gas Stocks.

The London Press last week referred generously to the exhibition—more so than was to be hoped, seeing how many of the dailies have fluttered for several years round the electric light. Even the cartoonists were set to work by the brilliance of what they saw at Earl's Court, and made merry over the fact that gas, enveloped in the incandescent mantle, was never in better health. Gas stocks were a lively market after the opening of the exhibition, and several lines in which there has been little movement for some time past went bounding upwards. The "Daily Telegraph" put the activity and strength down to the severe weather; but we rather fancy that some of the influence of Earl's Court found its way into the City. However, though the "Daily Telegraph" did not acknowledge this as having a share in the animation among gas stocks, it must not be imagined that our contemporary is inimical towards gas. The advocacy, in its columns, of gas cooking and heating some time since showed good knowledge and belief in the benefits to be derived by the community generally by the larger inroad of such conveniences into the household—one effect being that the greater the number of chimneys that desisted from the evil practice of sending out smoke, the less would be the density of London's particular brand of fog. Much on this point is to be learned at the exhibition if the Daily Press are anxious to add to their own knowledge, and to assist, by the dissemination of new knowledge, in improving the atmospherical conditions of London. The view of the "Lancet," produced no doubt by the exhibition, may be noted: "Gas lighting by modern methods of high-pressure incandescence, inverted burners, and so forth, threatens to outstrip electricity for general lighting purposes. This is no exaggeration when we reflect that invariably the finest streets in the great cities of Europe are now lighted with incandescent gas-burners."

Dr. Rostin's System of Lighting and Extinguishing Gas-Lamps.

In the notice last week of stand No. 110 in the Queen's Palace, which is in the occupation of Herr A. Landsberger, of Berlin, there should have been a reference to the exhibit of Dr. Rostin's automatic system of lighting and extinguishing street lamps by pressure from the gas-works. The exhibit consists of four lamp-posts, fitted complete with lanterns, single and duplex incandescent gas-burners, and the automatic apparatus, so that its action can be readily and convincingly demonstrated to visitors. The system was fully described and illustrated in the "JOURNAL" for Sept. 27 last. The recent foggy weather enables the inventor to make a strong point of the particular convenience of his apparatus in countries with such varying atmospheric conditions as ours—as it can be operated at any hour and as frequently as is required during the day, from the gas-works. A trial installation of a number of Dr. Rostin's appliances has been made in a suburban district; and the engineer reports that so far they are a thorough success. The exhibit is an interesting one at Earl's Court; and we hope the omission of reference to it last week has not led to anyone missing it.

Automatic Cashiers, Limited.

In the exhibition number of the "JOURNAL," a reference to the exhibit of this Company was omitted. It is to be found on stand No. 78A. It is a piece of apparatus of undoubted utility; and its inclusion in the exhibition is due to Mr. H. S. Smith-Rewse, who is one of the Directors of the Company. The part of the exhibit which specially concerns gas people is an accessory to the Company's automatic cash register which automatically counts and wraps up coins. One of the uses of the machine is the counting and wrapping of pennies from slot gas-meters. The system appears to be a good one; the bundles of coins, which can be made of any size and value, being wrapped in such a way that they cannot be undone and re-wrapped in the same manner by hand. Therefore detection of any interference with the contents of the packets is ensured.

Official Notes.

From a little budget of notes by the Press Manager, we extract the following: "The brusque arrival of an Arctic winter has found Earl's Court, thanks to the International Gas Exhibition, the one cosy pleasure resort in the Metropolis. During the opening week, snow, sleet, and ice have there in the buildings and grounds been defied by means of 573 gas stoves and ranges, and 4102 gas-lights fed by many hundreds of thousands of cubic feet of gas through miles of piping. The band of the Scots Guards has been replaced this week by that of the Coldstreams; and the attractions include vocal music from the bandstand. But this will in no way interfere with the nightly free entertainment in the Café Chantant."

GAS AND ITS INDUSTRIAL APPLICATIONS, AT THE ST. LOUIS EXPOSITION.

IN a paper submitted to the Iron and Steel Institute upon Mining and Metallurgy by Professor HENRY BAUERMAN, there are certain references to subjects interesting to "JOURNAL" readers, which we have summarized.

The Morgan gas-producer is exhibited as a full-sized example—part in section—and has sectional full-sized models of parts of heating furnaces for billet and rod working continuously. One of these has a system of water-cooled skid bearings for the billets, the other is the suspended roof Morgan heating furnace with continuous tubular heat recuperator for warming the air supplied by a fan blower at the upper end, and the gas-producer at the opposite end of the inclined bed. The gas-producer is of the tub or kiln-shaped form, standing above a water-seated ashpit, with a conical blast pipe delivering air by a steam-blower into the centre of the fuel. The feed arrangement is George's development of the Bildt spiral distribution; the distributing plant being fixed while the closed coal-hopper revolves around it by a system of toothed gearing driven from the shaft of an independent motor. These producers are made 8 and 10 feet diameter, corresponding to a gasifying power of an equal number of tons in 24 hours; about 88 per cent. of the thermal value of the fuel being delivered in the gas.

The most interesting feature in connection with coal is the fuel-testing plant of the United States Geological Survey, of Washington, with the co-operation of a very large number of machine-making and other firms, who have lent the necessary plant for the investigations. The object is to test on a working scale the evaporative and other values of any coal or other fuel that may be sent in for investigation. The plant includes three steam-boilers, a 350-horse power engine, driving a 250 kilowatt direct-current generator, a 275-horse power Westinghouse gas-engine with a smaller dynamo, a coal-washing plant, a rotary dryer for lignites and other wet fuel, two briquette machines for large and small size briquettes respectively, and three small size beehive coke ovens. For the gas-engine, a large gas-producer with scrubber and gasholder has been provided by Messrs. R. D. Wood and Co., of Philadelphia. For the chemical investigation, there is a complete laboratory equipped with all the material necessary for proximate and complete analysis, and calorimetric determinations by the Mahler bomb calorimeter. This plant, however, is not a mere temporary exhibition attraction, but is of a more permanent character, and will probably remain in use for a considerable time, as there is a prospect of the investigations being carried out on a very extensive scale.

The only contribution dealing with bye-product coke-oven practice is made by the Semet-Solvay Company, in conjunction with other firms. This comprises a full series of coal tar and other products condensed from coke-oven gases, examples of their varied uses, drawings of Otto-Hoffman and Semet-Solvay coke-ovens, and of the condensing plant of the Lackawanna Steel Company's coking works dealing with 33 million cubic feet daily. The principal novelties in the ovens are the adoption of a chain bucket elevator in conjunction with a travelling hopper box for filling, and the suppression of the cooling banks; the finished charge being either pushed into a closely-fitting metal receptacle, where it is cooled out of contact with the air, or allowed to fall into a hopper-shaped car subjected to a heavy flood of water, which drains off through the bottom of the car, leaving the coke in condition for loading.

The St. Louis district is an important centre for the fire-clay industry; the basis being a grey plastic clay occurring at the bottom of the coal measures which extend over an area of about 170 square miles. This when burnt combines refractory character with great strength, and is well suited for making gas-retorts. When burnt it takes a reddish-brown tint, with black spots due to the fluxing of interposed grains of pyrite in the same manner as the Glenboig brick, which it closely resembles in essentials. A more refractory material is the so-called flint fire-clay, which is essentially a compact, non-plastic, china clay. The composition is that of a nearly pure kaolinite, or china clay, but with a slight excess of alumina over Cornish clay, and a total of fluxing impurities varying from 1 to 2·8 per cent., and averaging 1·8 per cent. It is extremely refractory, but not very plastic, and can only be moulded by mixing it with a proportion of the grey clay. Examples of the application of these materials to the manufacturing of retorts and other moulded work are afforded, among others, by the Laclede Fire-Brick Company, who have a larger exhibit in the gas-works section, where some bricks for basic furnaces are shown containing 70 per cent. of alumina. These are obtained by adding bauxite to the natural clay mixtures.

Monazite sand is exhibited in the Brazilian Court as an important mineral. It occurs in the beaches along the sea coast in the province of Bahia; and as such is held as a State property, the working being let to contractors at a royalty. North Carolina has an interesting display, and a principal economic feature is the monazite sand. There is shown a method of concentrating the sand by the Wetherill magnetic separator; and the Welsbach Light Company contribute a series of products illustrating the method of separating and purifying the salts of the rare earths contained in these very complex minerals.

TESTING GAS AND ELECTRIC LIGHTING FOR INDOOR AND OUTDOOR PURPOSES.

With reference to the public tests which have been undertaken by the Westminster Electrical Testing Laboratory and Messrs. Simmance and Abady, already mentioned in the "Journal" (*ante*, p. 604), we learn that no tests were made during the past week upon gas-lamps of any description; the time having been occupied by the standardizing of various electrical secondary standards against the 10-candle pentane lamp, and arriving at a clear ratio between the various measuring instruments. Successful and complete tests have also been made upon the mercury vapour electric lamp and upon arcs, with and without any globe. It will interest our readers to know that very high candle powers have been obtained—under some conditions, upwards of 2000 candles. The taking of all the readings has been done very carefully; thus enabling the operators to arrive at a clear idea of the candle power per watt for lamps of these descriptions, both in the horizontal, at different angles, and on the basis of mean spherical intensity.

There has been a constant stream of interested visitors, mostly from various electric lighting stations throughout the country. There have also been representatives from foreign Governments, who, having had intimation of the tests, have taken the opportunity to send experts to witness the latest methods of testing as carried out in England, more particularly with the view of their adoption for lighthouse work. The professorial section has been well represented; various professors attending the tests from the Royal Naval College, University College, and several technical colleges in the Provinces. A considerable attendance of students from various polytechnics should also be noted. Comparatively few gas engineers have attended; in almost every case those who have paid a visit to the tests being gentlemen who in their own towns have had the question of electric light and its competition with gas in the streets brought prominently before them.

Messrs. Simmance and Abady hope, during the present week, to make good progress with the tests of high-power incandescent lighting; and practically all the makers of incandescent mantles, burners, and lamps have completed their arrangements for submitting representative samples of their manufactures.

THE OHIO ASSOCIATION BOARD OF REVISION.

A Suggestion from the Chairman, Dr. Harrop.

As will be seen by a report in another column, some part of the time of last Thursday's meeting of the Southern District Association at the Earl's Court Exhibition was taken up by the consideration of a letter that had been addressed to the Secretary (Mr. J. W. Helps) by Dr. H. B. Harrop, of Milwaukee, asking for the help of the Southern Association, in conjunction with the other District Associations, and perhaps later on the Institution of Gas Engineers, in, as far as possible, revising and supplementing the Question-Box system that has been so long in vogue in America. It may be remembered that in the "Journal" for April 19 last (p. 149) an account appeared of what the Ohio Gaslight Association are doing in this matter; and since then, in correspondence with Dr. Harrop, we have suggested that he should communicate with the various Associations in England to see how it is possible to extend the usefulness of this so far almost exclusively American feature of Association meetings.

As a result of considerable correspondence with Dr. Harrop and Mr. Doherty (whose name was mentioned in the "Journal" in connection with the Ohio Association's scheme), a letter was received from the former gentleman on Thursday last, in which something like a definite plan of procedure was sketched out for consideration by the Associations this side, though this is intended to be merely a temporary expedient to prevent such delay as would otherwise occur in the English Gas Associations joining in the scheme during the next revision of answers to entries in the Question-Box.

It will be well, however, to have Dr. Harrop's proposals in his own words. He says: "Now, the details so far are all unformed; and, in order that results may be attained in time for the first edition of the work we expect to publish in March next, I shall submit a definite plan for your approval or criticism. I propose (1) a Committee known as the Revision Committee, to represent the gas men of the British Isles, to consist *ex officio* of the Hon. Secretary of the Institution and the President of each of the seven District Associations, and, besides these eight gentlemen, two other members to be appointed by each organization, making 24 in all. There shall be an Editor of the Revision, who may or may not be one of the above 24 (in the latter contingency giving the Committee a membership of 25), who shall be chosen by the Committee. The Committee shall have full power to carry forward the co-operation with the American officers, limited only by such restrictions as may be provided by each of the British organizations at the time when it ratifies the proposal. I think this plan is feasible and safe, binding no one to impossibilities, and calculated to bring results quickly and surely. Now there is one further point. It seems to me (2) the undertaking on your side of the water would almost spring into being full grown if it were possible to initiate, from the beginning, the Question-Box feature on the same scale as we have it. The forthcoming issue of the Question-Box will consist of at least 500 new questions. We have succeeded in interesting the members of the American Society of Mechanical Engineers; and the contributions of questions on subjects of interest alike to the mechanical engineer and the gas man have been generous. From this and other causes, our list this year is of a better character and more interesting than before. I should like to put this list (or, rather, these lists, for we get out several successive editions as the contributed questions come in), into the hands of the fraternity on your side just as we do here. It would act as an incentive, and, in a sense, as a pattern, for the gathering of British material. If we will send you a sufficient supply of these lists from Denver, can I not ask you to take charge of the work, at least temporarily, and see that they are mailed to all the Association members? Still further, will you not make the answers returnable to your office, addressed to the 'Acting Editor of the Revision?'"

Pending consideration of the question by the other District Associations (and possibly, later on, the Institution of Gas Engineers), a communication has been addressed to Dr. Harrop, saying that the lists he refers to shall be distributed among the members of the District Associations as soon as received from him, and such replies as come to hand shall be at once sent on to him or anyone he designates to deal with them. Of course, we take it that this only refers to the list of new questions about to be issued, and does not include the larger question of revision in which the Associations are asked to participate. This seems clear if this communication is read in conjunction with the letter submitted by Mr. Helps, at the meeting of the Southern Association last Thursday.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 712.)

There was a decided improvement in the general tone of things on the Stock Exchange last week. The opening was quiet and calm, and a cheerful feeling soon made itself apparent and gradually spread. Prices steadied and then rose, some markets being especially buoyant. Of these, the South African was the most noticeable; and almost the only exception was the home railway market, which suffered from bad weather. In the Money Market there was an abundant supply, and all demands, whether for the Stock Exchange or end-of-the-month or other requirements, were easily met. The 3 per cent. Bank rate has now lasted seven months, and it wants only one month more to end the year; but much may happen in that time. The Gas Market has had a most interesting week. We made some reflections in our last issue as to the lowness of some quotations which the events of the week have more than justified. There has been an almost general readjustment of prices, especially those of the Metropolitan and Suburban and Provincial Companies; and the advances in quotations range from a 10 per cent. increase downwards. The better prices offered do not, however, appear to have brought many sellers into the market as yet, for, if we exclude the biggest issue from consideration, the aggregate of operations marked is not above the fair average. But, in Gaslight and Coke issues, the ordinary was active to a degree far surpassing anything attained for a very long time past. It had a fine rise too, and seemed to act as pioneer for the rest. The price on the opening day was as low as 94¾; from which it rapidly shot up, till on Thursday it touched 98¾. Of the secured issues, the maximum ranged from 90¼ to 98½, and the debenture from 87¾ to 88¼. The preference was not dealt in. South Metropolitan was quiet, with only two transactions at 128¾ and 129; and the debenture had likewise two, at 89⅛ and 89⅜. Commercial 4 per cent. was marked at 110¾, the 3½ per cent. at 107, and the debenture at 86¼. In the Suburban and Provincial group, business was on a restricted scale; but most of the issues had a more or less considerable improvement—the best being a rise of 10 in Brighton ordinary, which was done once at 162½. Alliance and Dublin old marked 21 and 21⅛; and British 40½. North Middlesex changed hands at 19¾. South Suburban ordinary was done at 120¾ and 122, and the preference at 124. West Ham ordinary marked 99¾ and par, and the preference 120½. The Continentals were rather quiet and unchanged. Dealings in Imperial ranged from 206 to 207¾, a "special" deal in Union preference was at 139; and European was untouched. Among the remoter undertakings, Cape Town and South African attracted attention. Of the former Company, the ordinary shares were done at 14½ and 14 1/16, the preference at 9 7/16 and 9½, and the debenture stock at 99½; while South African realized from 16⅛ to 16⅝. Oriental changed hands at 145½ and 147. Primitiva ordinary marked 5 1/16 and 5¾, the preference 4 1/16 and 4⅞, and the debenture 95. Monte Video was dealt in at from 10⅝ to 10¾, River Plate at 11¾, and ditto debenture at 96. Melbourne 4½ per cent. debentures marked 100¼.

The closing quotations are shown in our stock and share list.

ELECTRIC LIGHTING MEMORANDA.

The Gas-Engine in Central Electricity Supply Stations—Experiments and Figures from Hebden Bridge—American Electricity Companies and their Consumers—Fogs and Central Station Chimneys.

THE gas-engine has not made in this country great headway for central station purposes; and in cases where it has been installed in recent years, it has been generally accompanied by a producer gas plant. Although the gas industry continues to draw in new business year after year at a very gratifying rate, the electrical industry is also doing a large business in electric lighting; and to the extent that it is accomplishing this, there has been loss for the gas industry. That is as plain as the simple arithmetical certainty that two and two make four. It has been proved by actual demonstration that the most economical form of electrical supply for large establishments is by a gas-driven plant from the ordinary gas-supply mains, where the gas for the purpose is furnished at a cheap rate. Then why should not the gas industry have an interest in the electrical industry by supplying the power for the larger supply installations, and so recoup itself in a measure for the loss sustained by such success as is achieved by electric lighting? This is by no means a question that is very striking for its freshness. But it is one that again comes to the fore, through the renewed interest in the subject of gas-driven plants in electrical circles. It was not long since that we called attention to an account of what is being done in this regard at the Walthamstow electricity station; and this week's electrical papers contain several references to the general subject which cannot fail in producing an active interest in the performances of gas-engines for generating purposes. But this will not benefit the gas industry unless the engineers and managers of town gas supplies exercise some immediate concern in the matter, and ascertain precisely what they can do and what they have to offer. Producer gas is gaining ground while the gas engineer is looking idly on. Fuel economy is the point that the electrical station engineer has to principally look to for the reduction of his works costs. Experience is accumulating proof that producer gas driven plant is more economical than steam-driven sets; and at any rate on a moderate-size plant, coal gas at 1s. 9d. per 1000 cubic feet has proved cheaper than steam. What the gas engineer has to do if he wants to get his share of the business that is to be had in this direction is to supply the electrical engineer with gas which shall be as economical to him as the producer grade of gas; and if he can do this, the additional assurance that the electrical engineer has in the reserve provided for him in the gas-works holders, will be a consideration that will not be ignored.

One paragraph of Mr. Walter Emmott's presidential address, of a few days since, to the Leeds Section of the Institution of Electrical Engineers dealt with this question of gas-driven plants. Mr. Emmott is an Electrical Engineer with experience in central station work with gas-engines using lighting gas; but yet there are indications in his address of a favourable tendency, under existing circumstances, towards independent power-gas installations. He seems to be satisfied that the question of economical power-gas production is settled; and, without hesitation, he announces his conviction—formed from his own practice and observation—that electrical engineers need have no fear in installing large power gas-engines for central station work. He has had the installing of two four-cylinder 300 brake horse power (250 revolutions per minute) engines; and he finds that, running under varying loads, and with varying thermal efficiencies of gas, they are equal to the best steam-engines as to steadiness. He is, however, fair to the steam-engine—citing various small incidental advantages in first cost and running on the side of the latter. But the weight of advantage and running costs are in favour of gas. It cannot be a matter of negligible moment to an electrical engineer to know that, with a supply of gas at hand, there is no difficulty in starting up and getting current on to the switchboard in slightly under a minute. But with producer gas, the supply of gas may not always be at hand, where it is not obtainable from a general system of supply; and this is an assured convenience that in every town the existing gas-works can offer the electrical engineer. In the final sentences of his paragraph, Mr. Emmott states the conclusion he has arrived at, and issues his invitation to the gas engineer. This is what he says:

> For small stations—say, to meet the requirements up to 15,000 inhabitants—a gas-driven plant will, to my mind, prove to be a most successful combination in the very near future. I even venture to think that we may see our competitor, the municipal gas engineer, supply us with the necessary power gas as our fuel, in some instances, at no very distant date. We have rendered inestimable value to the public at large, and to the gas engineer in particular, by our healthy competition in lighting, by stirring up the gas industry to increased efficiency in gas mantles, and in a multitude of other directions; and I see no reason why, where circumstances are favourable, we should not, with that brotherly love which is supposed to exist among various branches of the engineering fraternity, let one department of a municipal undertaking help the other, in the manner indicated.

On the occasion that Mr. Emmott delivered his address, Mr. Hugh Campbell very appropriately read a paper on gas-engines for central stations; and the special point of interest to us about it is that he includes in it the results, with a four-cylinder gas-engine, of a four-hours' test-run made by Mr. Emmott and his assistants at the Hebden Bridge electric lighting station. This engine is supplied with lighting gas of 600 British thermal units; and in view of this, the maximum brake horse power developed is 350. The capacity of the dynamo is 140 kilowatts, and the maximum kilowatts generated are 146·4. The gas consumed per kilowatt-hour at 146·4 kilowatt-hour load was 21·96 cubic feet; and the gas consumed per kilowatt-hour at 75 kilowatt-load was 26·7 cubic feet. The cost of the gas is 1s. 9d. per 1000 cubic feet; and the fuel cost per unit generated was 0·462d. The efficiency of the dynamo was 93 per cent.; the mechanical efficiency of the combined engine and dynamo was 77 per cent. The thermal efficiency of the engine was 33·7 per cent. The fuel cost per unit generate is not quite so good as the producer gas example quoted by Mr. Campbell; but better results and efficiency could no doubt have been secured if it had been possible to put more load on the engine. Anyway there are numbers of central stations where steam plant is used in which the engineers will look a bit envious at these figures. Comparing the figures, too, with experience at Belfast some years ago in using engines employing lighting gas of equal thermal value, it is seen that very gratifying progress in economy has been made in the years since. These facts should be weighed by gas engineers, as they claim their serious consideration unless they confess at once that they have already decided that there is no hope for them in competing with producer gas in central station work. Mr. Emmott is an electrical engineer with considerable experience; and he at all events has hope of greater things. Is that hope misplaced?

Another presidential address is that of Mr. C. D. Taite to the Manchester Section of the Institution of Electrical Engineers. Mr. Taite has been over to America with the Institution; and he has filled his address with observations made during the tour. This is a change from the ordinary run of presidential deliverances. There is one part in which it is found that the Americans have shown greater wisdom than on this side. Municipalities in the United States have not been so keen in taking up electricity supply as have our local authorities (to the disadvantage in numbers of cases of the ratepayers) at home. The companies, too, from what he says, are in advance in business capacity of privately owned concerns in this country. They have recognized what British gas companies have so long practised—the value of getting into closer touch with consumers. The electricity companies in America almost monopolize the wiring business; and they give free lamps to the consumers—the Edison companies especially having large organizations for dealing with this branch of their business. It is seen, too, that the consumers are not supplied with indifferent lamps. All the lamps prior to being sent out are tested for candle-power and consumption; the limit for a 16-candle power lamp being in the region of 14·5-candle power, and the consumption 3·2 watts per candle power. The life of the lamp is only reckoned at 500 hours. The system of giving these lamps free, it is stated, adds about ¼d. per unit to the price of current; but this figure, Mr. Taite thinks, is rather under the mark—the total cost of the system being between ½d. and ¾d. The consumer, however, is thus assured of always having bright lamps; and the President testifies from his observation that they are so. But he fears the American system would not answer in this country. And why? The answer is simply that electricity suppliers here are afraid of giving offence to the local electrical fitters and retailers of lamps and accessories. The gas industry would not have scored to the degree they have done if they had left the gas-fitting business to the lethargic local dealers.

The recent fog infliction in London and other large centres has given an opportunity for correspondents in the daily press to relieve their souls on this perennial and prolific subject, and even to get free advertisement for their specifics for reducing the density of fogs. The best means of bringing about reduction are, of course, the abolition of the factory chimney by the adoption of motive power supplied by gas, and by the supplanting of the domestic coal-fire grate by gas cookers and fires. One correspondent in an evening contemporary has made a very unkind suggestion. When a fog comes on, the electric cables are drawn upon heavily, and the stokers at the electric light station have then to stoke for all they are worth, with the terrible result, the correspondent points out, that the central station chimney belches forth its contribution of smoke (when least wanted), and so assists in rendering the fog of suffocating density. The gentleman in question will not be thanked by central station engineers for implicating them in the nuisance.

British Association of Water-Works Engineers.—The winter meeting is to be held at the Geographical Society's Rooms at Burlington House on Saturday, Dec. 10. The ordinary business will first be taken; and then three papers will be read and discussed. The first is by Mr. George Mitchell on "The Appleton Extensions of the Warrington Corporation Water-Works;" the second, by Mr. Frank Latham, of Penzance, on the "Supply of Surface and Underground Water to Towns;" and the third by Mr. J. Hutton, of Scarborough, on "Electrically Driven Pumping Plant for Water Supply, and Storage of Water under Pressure." An interesting incident will be the presentation to Dr. Kemna, of Antwerp, of a gift subscribed by members and friends who took part in the tour in Belgium.

AN IMPROVED ARRANGEMENT OF CARBONIZING PLANT.

THERE is perhaps no more trite saying in the gas industry than that "money is made or lost in the retort-house;" and it is as true as it is well-worn. Therefore any new system whereby the initial capital expenditure is kept low, without sacrificing economy in the manufacturing operations, deserves careful scrutiny. In the setting of retorts which it is proposed to describe, the aim has been to effect a saving in several ways—not the least important being in the cost of the plant.

We have, in these columns, descanted on the ready way in which municipal authorities agree to schemes, involving a large outlay, requiring an increase in borrowing powers, and which, when completed, are too often a burden upon, rather than a relief to, the ratepayers. Our remarks have applied equally to projects in which the outlay was purely for the improvement in the æsthetic features of the town, and to those in which the idea was also for the betterment of its productive power. Nobody would dream of objecting to the latter combining the qualities of the former, so

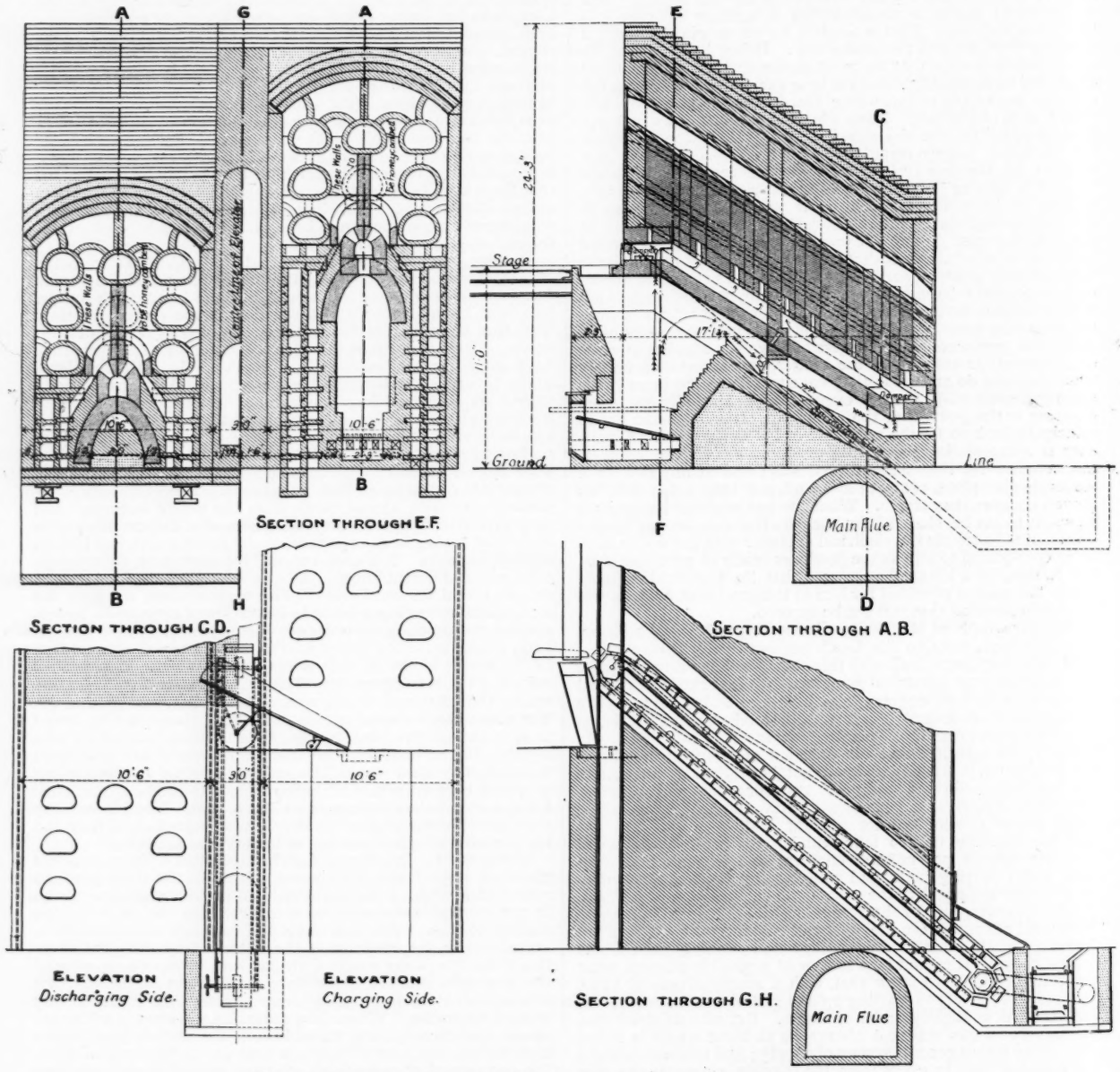


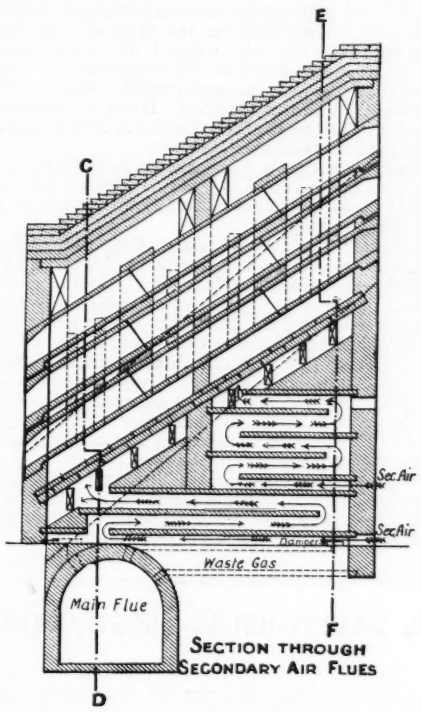
FIG. 1.—ARCHIBALD LITTLE'S PATENT DWARF INCLINED RETORT BENCH.

long as the initial expenditure did not become a heavy tax on the pockets of the people; but it is feared the fact is too often lost sight of, that it is not till the functions requisite to sustain life have had proper scope accorded them that the æsthetic feelings gain power to act. A hungry ratepayer, for instance, would not get much consolation from the sight of statues, fountains, parks, or even a retort-house with architectural beauties. The primary object of all councillors should be to spend public money only for such purposes as are likely to become remunerative; and if efficiency can be obtained by a small expenditure, it is robbery to lay out more, because the interest becomes a charge upon ratepayers out of all proportion to the benefits they receive. By efficiency is meant the greatest possible output, with the lowest labour, operating and up-keep charges, no matter what the initial cost so long as there is a call for all that the works can economically produce. If, in addition, this embraces the amelioration of the lot of the labourer, then success is certain. Fortunately, gas committees in this country have, in their engineers, competent advisers upon such matters; and the result is that, where large debts are incurred, these are generally due to the extravagance of other departments. At the same time, any new manufacturing methods should be immediately brought before the notice of those responsible for the choice of the best.

These remarks are merely prefatory to the details which we are about to give of a new carbonizing scheme designed by Mr. Archibald Little. Fig. 1 shows an inclined retort-bed, in which the producer is built in the space formed by the angle made by the retort and ground line. Such an arrangement is not new; but there are other and more important features which will be referred to. Mr. Newbigging in his "Handbook," states that a depth of full 5 ft. 6 in., and an area of 75 cubic feet is sufficient for 20-feet retorts set in a bed of eight. The one shown has a depth of 7 ft., and area of 90 cubic feet. To control the combustible gas carbon monoxide, two dampers are used—the one at top regulating the supply to the upper section of the setting, and the one at the bottom the corresponding lower section. The

air necessary for the combustion of the fuel is admitted at the bottom of the producer through nostrils, regulated by dampers. Above the producer is a gas arch in which are built well-proportioned exit-holes for the gas; the sizes of these having been found by experiment. The gases passing through them meet the heated air admitted for their complete combustion.

The secondary air is heated by traversing passages, running parallel to those which conduct the waste gases to the main flue. The inventor is of the opinion that the secondary air takes up its heat quickly; and the passages are therefore shorter than those in ordinary inclined retort regenerators. In defence of his claim,



SECTION THROUGH SECONDARY AIR FLUES

he points to experiments made by shutting out portions of the passages in such regenerators, when it was found that the efficiency was not impaired. In this view also, Mr. Little follows the ruling laid down in "Newbigging's Handbook" (p. 55, seventh edition). On p. 56, it is pointed out that the secrets of success in working are:

(1) To get up the heat very slowly, and gently at the outset, drying the brickwork gradually and thoroughly, at a low temperature.
(2) To charge the generator with hot coke, as drawn from the retorts.
(3) To carefully regulate the primary air supply and keep the ash-pans full of water.
(4) To insist upon the generators being kept quite full of coke. . . . The generators should be filled up every time the retorts are drawn.

It will therefore not be out of place to inquire in what particulars the setting under consideration answers to these requirements.

(1) The setting is designed so that the heats can be got up slowly; and the amount of brickwork is so much less than in ordinary settings that the time required for the low heat to penetrate the whole of it should, therefore, be considerably reduced. What first strikes the observer is the negligible amount of filling-in required; every part of the brickwork being utilized, and red or common clay bricks being almost entirely absent.
(2) On the illustrations, it will be noticed that provision is made for charging the generator with hot coke, as drawn from the furnace. Between every two beds is built a tunnel, which in no way affects the stability of the bench. In this works an elevator of simple, yet exceedingly strong, design, which, the inventor claims, will allow the hot coke to be drawn from the retorts, and directed into it, for raising automatically to the higher level. On this is placed a movable shoot, down which the coke slides to the producer; the mouth of this being left quite clear to enable the stoker to thoroughly attend to the filling.
(3) Both the primary and secondary air can be regulated to a nicety. The latter is divided into four sections for each bed, as in other settings.
(4) The generators can be kept full of coke more readily and with less labour than on the old system; the stokers being able to charge the elevator, with equal ease, by coke received from any of the sixteen retorts in two beds. On the old plan, the shoot used for charging the furnace is ponderous and unwieldy, and more often than not, the stoker, sooner than haul it about, draws the outside retorts on to the stage and charges the furnace with partly quenched coke.

It will be further observed that there are four dampers for regulating the several waste-gas outlets to the main flue; so that there can be no fear of the heat on the retorts not being uniform. Above the producer arch, the arrangement of retorts and gas

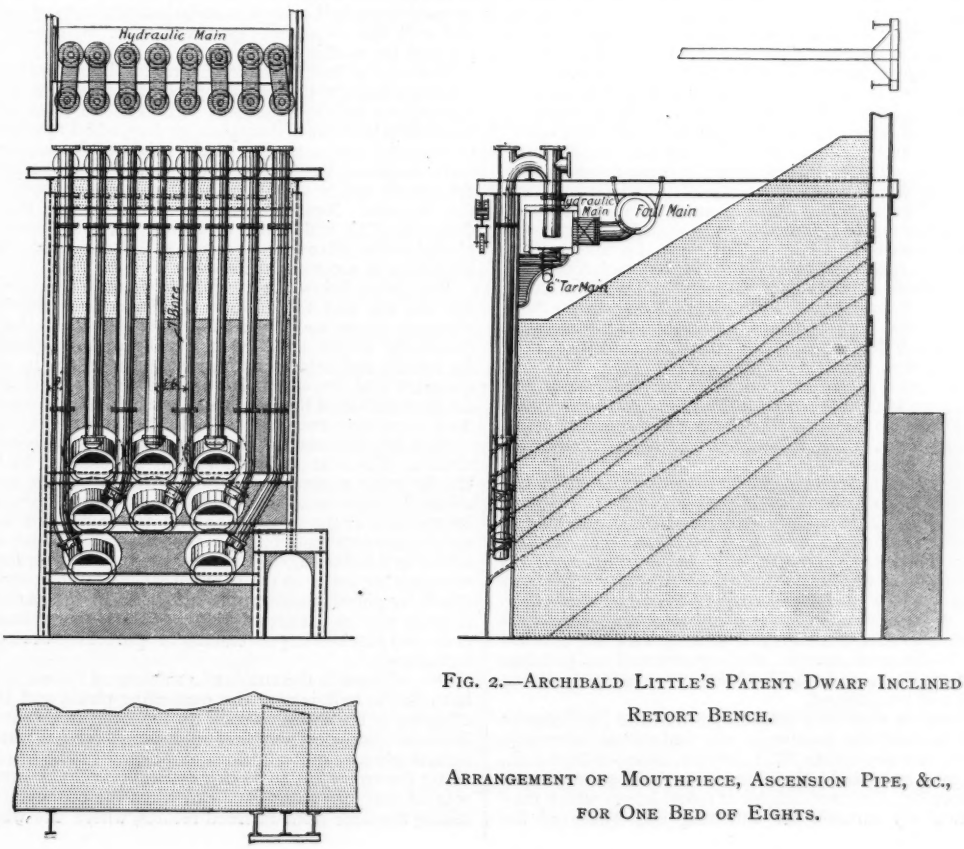


FIG. 2.—ARCHIBALD LITTLE'S PATENT DWARF INCLINED RETORT BENCH.

ARRANGEMENT OF MOUTHPIECE, ASCENSION PIPE, &c., FOR ONE BED OF EIGHTS.

passages is a facsimile of that adopted on over a dozen inclined retort plants, all of which are working exceedingly well—all the eight retorts being so nicely heated that six-hour charges are thoroughly burnt off with the two dampers open ⅝ inch at the back and ¾ inch on the two at the front. It is, therefore, only to be expected that equally good results will follow, provided the producer and regenerator work as well as the inventor has every reason to anticipate.

Leaving the brickwork, we are confronted with the problem of bracing. It is admitted on all hands that the failure of early inclined retort plants was in a great degree attributable to lack of material in the ironwork used as superstructure; this being responsible more than anything else for the slow rate of progress in the United States with this system, because, on the trial plant, failure was immediate and complete through the sliding of the brickwork into the drawing area. Even now the stresses, due to the angle and expansion, are so great that, in a number of instances, though heavy scantlings are used, the great length of the buckstays causes them to bulge out just at the point where the greatest strength and stability are required, which is, of course, just under the lower ends of the retorts by the drawing-stage. The greatest fault results in the lower front wall being forced out by the heat at this point; and the pressure on the mouthpiece stays, supplementing that on the ascension-pipe rail bars, buckles the buckstays; and frequently this ends in the division-walls of the bench cracking. Then bye-passing takes place between adjoining beds. It is interesting to note what is likely to be the effect on this new setting. The lower buckstays are much shorter, and the bottom end is securely bedded in the concrete just at the point where the greatest pressure comes. Consequently there can be no bellying of the joist; and all the thrust is taken up by the ground. It is understood that the arrangement shown for bracing the bottom end of these buckstays is only a sketch design; and, in the actual setting, provision for cross-ties and for strengthening the junction at the bridge is arranged for. Owing to the reduced span between the ends of the upper buckstays, the section of these can be considerably reduced without weakening the stability of the complete structure.

The distance required between the centres of the division-walls in a bench containing eight retorts per bed, cannot be less than 11 ft. 9 in. (with three rows of retorts), and is generally 12 feet. This is not because of the heating arrangements, but is owing to the fact that where separate ascension-pipes are used to each retort, this is the minimum space in which they can be placed. It is a well authenticated fact that, where the twin-pipe arrangement was adopted in beds 10 ft. 9 in. centres, this allowed ample room between the piers for flues, &c., and the heating is quite as good as on 12 feet beds. The space between the piers on the new setting is equal to that on 10 ft. 9 in. centre division walls; and the extra brickwork between every two beds (for the coke feeder) gives the extra space required for the eighth ascension-pipe without increasing the over-all length of the bench.

One reason why regenerator settings have, up to now, generally been built with a stage-floor on the drawing side was to get facility for removing the coke without the stoker being inconvenienced by the heat; but now that engineers have the choice of adopting coke-conveyors of such excellent designs, this objection to ground-floor houses vanishes. It will be seen, by referring to the drawings that, by making a culvert, the coke can be drawn direct from the retorts into the conveyor.

Concluding this notice, it may be remarked that the position in which the main flue is shown is given only by way of suggestion; and it could be in any other convenient position—for instance, under the charging-stage.

Newbigging's "Handbook" states that the advantages of regenerative arrangements are due not only, or chiefly, to the heating of the secondary air, but largely to the circumstance that the heat of the waste gases, as the latter traverse the passages constructed alongside the furnace, is at a potential higher than that to which the brickwork in the base of the setting, and in the sides of the generator in the absence of the waste gas flues, could possibly attain. The effect of this is to insulate, as it were, the heat of the furnace, minimizing outward radiation and conduction. Mr. Little claims that, in his new setting, the insulation of the heat in the furnace is apparent in a much greater degree than in existing settings.

The retort-bench has been patented in Great Britain, Germany, and the United States. Inclined-retort benches on this principle can be built in houses that are designed for machine charging, measuring, say, 32 feet to the top of the wall.

THE DE BROUWER-JENKINS PLAN OF ECONOMICAL RETORT-HOUSE CONSTRUCTION.

It is curious to observe how a comparatively small invention will render possible vast alterations in methods of working, and change the whole economical aspect of an old-established industry. The inclined-retort system, for instance, in its modern and successful form, though no new invention, as those who possess a copy of "Clegg's Treatise on Gas Manufacture" well know, brought into possibility an ideal which had been in men's minds from the early days of gas manufacture; that ideal being the reduction of the arduous labour of charging and discharging gas-retorts by utilizing the force of gravity to assist in both processes.

The introduction of the inclined retort brought fresh ideals to the gas engineer, and showed him fresh objects to aim at in working his horizontal retorts. Those who least admire the inclined retort as a principle will not withhold from the system some praise for the systematic handling of the material which its service brought about. For instance, there cannot be a doubt as to the excellence of the method of dealing with the coal on one side of the retort-bench entirely, while dealing with the coke on the opposite side. Nor can there be any dispute that such a method simplifies the handling of the coal on the one hand, and the handling of the coke on the other. And while symplifying the method, the mechanism is also reduced, because a single coal plant and a single coke plant will deal with double quantities, and thus have a better chance of recouping the capital outlay.

The inclined retort, therefore, brought to the believer in the horizontal retort an ideal to be striven for—viz., the supply of all his coal to one side of the retort-bench, and the removal of all his coke from the other. The object of this article is to show how this ideal can now be attained.

The invention of simple means by which retorts, 20 feet long, or longer if desirable, can be charged evenly and well from one end, has made it possible to deal with the coal at one side of the bench, and has thus solved half of the problem. But the principle upon which the successful charging depends has also made easy the solution of the other portion of the problem; and the introduction of the pusher-discharging machine, depending as it does for its success upon the regular, even, and continuous charge, has accomplished the object of dealing with the coke on the other side of the retort-bench. Both features of the problem are now accomplished, and, incidentally, other very desirable improvements will be attained.

Having proved to their own satisfaction that the De Brouwer charging and discharging machines are undoubted successes, M. De Brouwer, assisted by Mr. W. J. Jenkins, Assoc.M.Inst.C.E., has not been long in pushing these ideas to the legitimate end. They have, therefore, designed a form of retort-house which they consider particularly suitable for attaining the whole of the advantages possible from the use of the various machines in the introduction of which they have become associated—the one as inventor, and the other as manufacturer and introducer to the British public. The accompanying cross section and plan show all the principle features of a retort-house arranged in the proposed manner with retort-benches on two sides of a central space, or machinery hall, with a 72 to 90 hours' supply of coal overhead, and with the ascension-pipes and other fittings in convenient position for working.

The central hall is made of structural steelwork, which forms the standards for the coal-hoppers, as well as the buckstays and the carriers for the main roof. The vertical sides of the hopper are built in the form of deep plate girders, which span from standard to standard, and carry the whole weight of the coal and the structure containing it. The girders across the hall below the hoppers are merely ties or struts to the standards, and not supports for the hoppers. Near the bottom of the hopper, there are slide-doors through which the measuring chambers are filled; and platforms for attending to the pipes stretch from end to end of the house at a convenient level.

The space below the machinery floor is intended to contain the engines and the electric generators for driving the coal-elevating plant and the stoking machines and coke plant. The remainder of the space would make stokers' lobbies, or stores for bricks and retorts, as only sufficient room to attend to the dampers and flue-doors is required on this side of the bench. On the outside of the benches, the whole of the coke handling is done; and here the most radical changes are proposed.

First the fires are fed from the retorts direct through the usua shoots. Then the surplus coke can be removed by the ordinary De Brouwer coke-conveyor, on which it can be quenched and stored in hoppers at either end of the house. The coke can also be stored over the yard at the end of the house if desired. The coke-conveyors now being made can claim to be automatic in action in a fuller degree than was the case at first; for the method of supplying water to the place at which the conveyor bends upwards, required considerable attention, in the earlier examples, if water was an article of value. In the recent examples, however, two marked improvements in quenching devices have been introduced.

One of these is the automatic starting of the water supply when hot coke in bulk is near the quenching-place, and the automatic stopping of the water as soon as the coke has passed. The De Brouwer conveyor was first introduced for use with horizontal retorts where small and regular heaps of coke were distributed along the conveyor, so that a constant average supply of water was all that was desirable. But when the conveyor was used for taking the coke from inclined retorts, where the whole contents

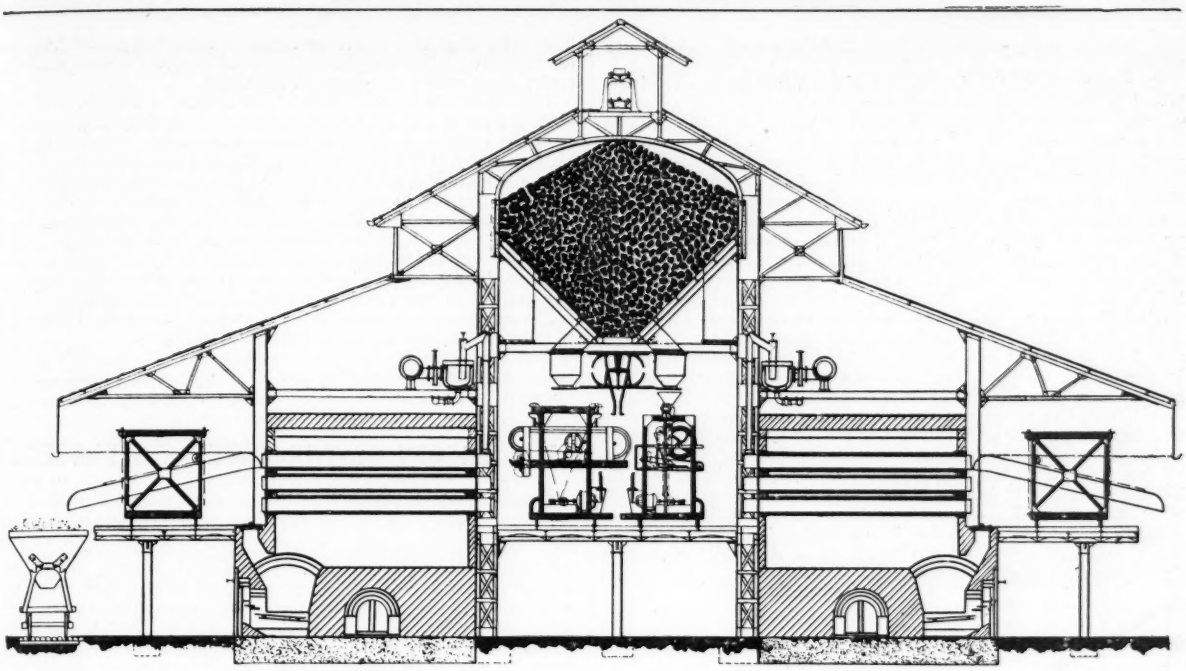


FIG. 1.—CROSS SECTION OF THE RETORT HOUSE.

of a 20-feet retort were dumped on the conveyor in a length of 6 feet, much more attention was required at the curve, or the coke would go up the conveyor only partly quenched. If, on the other hand, sufficient water was admitted to the conveyor to thoroughly quench the greatest heaps of coke, smaller quantities would be sodden with water, and much water would be wasted at the overflow. The automatic opening and closing of the water supply has changed all this, by allowing much more water to be poured upon the coke when large heaps are passing, graduating down to nothing when small quantities are on the conveyor.

The other improvement in the quenching features of the conveyor was found out, like many other good things, by accident. At the Bury Gas-Works, Mr. Henry Simmonds, when designing the arrangement of De Brouwer conveyors to suit his very cramped yard space, wished to transfer the steam produced as high above the yard as possible, to prevent horses being frightened, and to render the yard a more pleasant place to work in. He therefore suggested that the sloping end of the conveyor should be covered in, and an iron chimney erected near the top of the slope, to carry the steam into the air some 30 feet from the ground. This was done. An observer, whose interest it was to perfect all features of the working of the conveyor, noticed that the coke at Bury was always clean and silvery in appearance, and never so wet as at other places under similar conditions of working. On breaking a large lump of coke immediately it left the conveyor, it was found that all sign of red heat was gone, yet the coke was too hot to hold. Attention was thus called to the action of the steam in the long-covered-in portion of the conveyor, causing air to be excluded, and the quenching to be done by the steam. The coke at the end of its contact with the steam would still be at a temperature near the boiling-point—too cool to take fire again, yet hot enough to evaporate surplus moisture. The same idea has

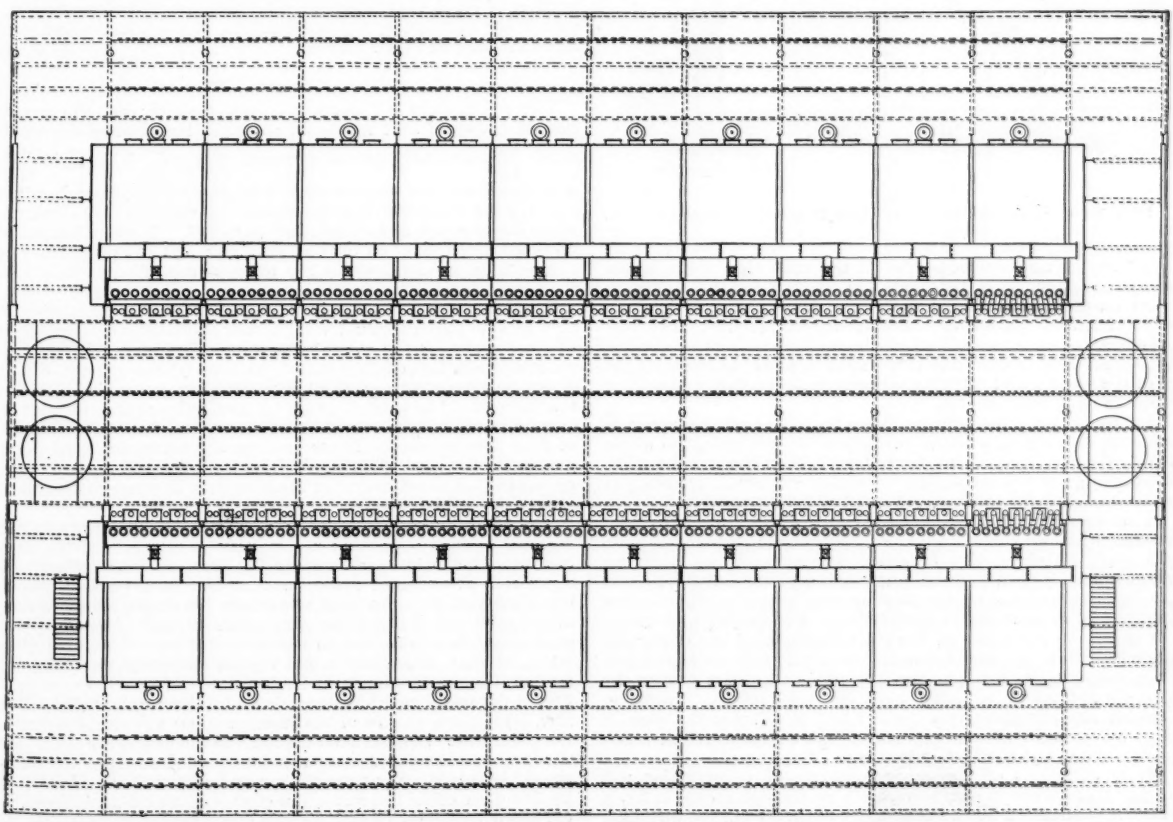


FIG. 2.—PLAN OF THE RETORT HOUSE.

been used on many conveyors since, and always with satisfactory results.

To return now to the description of the retort-house drawings. It will be noticed that the stage floors at the coke side are only narrow. This is to facilitate disposal of the coke at the sides of the house in cases where conveyors are not needed, or where trucks or canal barges can be used, or where the coke can be handled satisfactorily from the ground. The travelling carriage shown on the cross section is a development of the quenching idea mentioned above, and is the subject of a patent, provisional protection for which has been granted. Between the frames of the carriage are placed two or more chambers of about the same section as the retort, but a little larger, and long enough to hold a charge of coke. The chamber is either water-jacketed or cooled by other means, and is closed where practicable from the atmosphere. The chamber is brought opposite the retort, and the coke is pushed out into it, and then the quenching water is turned on, so quenching the coke as far as possible in an atmosphere of steam. When quenched, the vessel is placed opposite another retort, and the coke coming from the retort pushes that in the chamber out at the other end, and so into the waggons or barges or on to the ground. It will be observed that, during all these operations, the coke is gently handled, and therefore little breeze is made. It is remarkable to notice how completely the whole process works out, and how little rough handling the coke gets. The quenching chamber is arranged so that it can be tilted in either direction, so that the firing can be done with quenched or unquenched coke if desired.

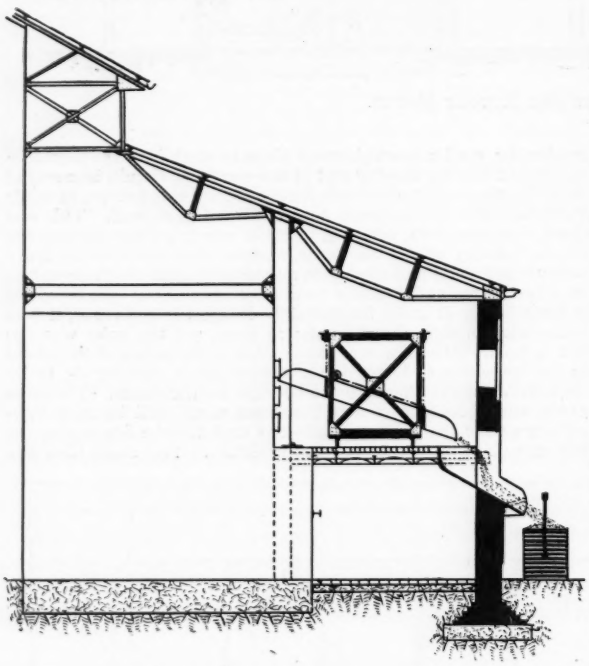


Fig. 3.—A Galvanised Covering for Coke Stages.

As there are no ascension-pipes at the coke side of the house there is no augering to be done, and nothing for the stoker to attend to, except the placing of the quenching chamber opposite the retorts, and the opening and closing of the lids. The last short piece of coke is allowed to remain in the retort by making the pushing-head not of sufficient stroke to push the charge right out of the retort; and this bit of coke acts as the stop for the next charge to abut against.

The space for coke storage along the sides of the house is ample for containing, without any labour or trimming, the whole of the coke produced during three days. Then there is the additional storage at the coke-conveyor end of the house, enabling at least a week's make to be stored in all without handling.

In most countries like England, it is a subject for individual decision whether galvanized iron roofing and sides would be sufficiently durable. But in drier atmospheres no ordinary bricks whatever need be used, nor need anything but steel enter into the construction of the retort-house, except perhaps a few glass panels at each end of the building. For England, however, it may not be desirable on the score of economy to employ galvanized roofing, so slates are used and brick gable walls and side walls, suggested by fig. 3, in case objections may arise against the open shed form of covering over the coke-stages. Bricks in England are comparatively cheap; but this is not the case in many other lands. In such places, a form of construction which needs nothing but steel offers immense advantages.

Many variations of the general scheme of construction will suggest themselves to engineers, such as the one shown in fig. 3, where it is intended for the coke to be pushed from the quencher into shoots or tanks going through the side walls; and delivering it into the skips of a crane arranged to run on a gantry outside, for supplying either hoppers, or an outside store, or else stacking under sheds within the range of the crane.

The many economical advantages of such a retort-house are obvious; but it may be said that the cost of carbonizing from the time the railway waggon is delivered near the breaker to the final delivery of the coke either to the store or to the hoppers in the yard, including all kinds of retort-house labour, should be less than 8d. per ton of coal. One of the advantages of this construction is its extremely easy adaptability to extension. Beds may be erected along one side only of the central hall to begin with; the other side may be filled in one bed at a time, or additional beds may be added one by one at the end. Then the ease of transport to foreign countries and the colonies is also striking. Slight modifications would make the house practically indestructible by earthquakes such as they have in Japan.

The machines are intended to be turned at the ends of the house on turntables; so that one set or pair would work a house of twenty beds or more.

THE THEORY OF THE WATER-GAS PROCESS.

There have been many disquisitions of late on the theory of the water-gas process, and a large proportion of them have emanated from Viennese scientists. In this category falls a lecture given by Professor von Jüptner before a technical meeting at Breslau a short time ago. According to a report of this lecture in the "Chemiker Zeitung," it would seem that it opened with a recapitulation of matter that is common knowledge with all water-gas engineers. Briefly the lecturer indicated at the outset the reasons why the first of the two possible reactions between steam and heated carbon is that which must be aimed at in the manufacture of water gas. The reactions are—

$$(1) \quad C + H_2O = CO + H_2$$
$$(2) \quad C + 2H_2O = CO_2 + 2H_2.$$

In order to ascertain the temperature most favourable for the production of water gas (that is to say for the consummation of the first reaction) he proceeds from the equation—

$$(3) \quad CO_2 + H_2 \rightleftharpoons CO + H_2O.$$

This equilibrium is independent of the pressure, as all the constituents are gases. The following equation of the reacting masses applies to it—

$$\frac{\mathbf{C}_{CO} \times \mathbf{C}_{H_2O}}{\mathbf{C}_{CO_2} \times \mathbf{C}_{H_2}} = k \text{ or } \frac{\mathbf{C}_{CO}}{\mathbf{C}_{CO_2}} = k \frac{\mathbf{C}_{H_2}}{\mathbf{C}_{H_2O}}$$

An infinite number of conditions of equilibrium exist for every temperature; as to each ratio of CO to CO_2 there corresponds another of H_2 to H_2O. Equation (3) does not, therefore, by itself, suffice for calculating the combination of the ideal water gas. Another must be taken also—

$$(4) \quad CO_2 + C \rightleftharpoons 2CO$$

This equilibrium is dependent on the pressure; and the formation of carbonic acid increases with additional pressure. The ratio $\frac{CO}{CO_2}$ increases as the pressure falls off. The ratio $\frac{H_2}{H_2O}$ also changes in the same sense. The proportion of combustible gases in the water gas thus increases, for the same temperature, when the pressure diminishes, and *vice versâ*. The equilibrium of (4) is also dependent on the temperature; and the proportion of carbonic oxide increases as the temperature rises, as does also the proportion of combustible gases in the water gas.

Without going more deeply into the method of calculating, it may be said that Professor von Jüptner showed by diagrams and figures that he arrived at the following conclusions: It is essential for the production of good water gas that (1) the tension of the steam be not too high, (2) the temperature of gas making do not fall below 800° to 900° C., and (3) the temperature of 900° to 1000° C. need not be exceeded with a tension of steam of upwards of four atmospheres. These are the conditions for ideal water gas, or for the case when equilibrium is attained in the water-gas generator. The behaviour of the generator in other cases can be judged diagrammatically.

The conditions in the generator when equilibrium is not attained are next reviewed. The ideal condition is attained at the zone of contact between the steam and the incandescent carbon, and a gas rich in carbonic oxide results. But as it passes through the generator, this gas falls away from its original composition, in consequence of the mixing due to the current of steam. This gaseous mixture is caused to react by the incandescent carbon layer, so that ultimately a gas results corresponding with the temperature of the generator for the time being. The composition of the water gas thus depends on (1) the depth of the bed of fuel, (2) the rate of flow of the steam, and (3) the temperature of the generator. In regard to the practical working of the generator, the lecturer considered it of paramount importance that the steam should be introduced at the coldest end of the fuel bed, as only by this plan could the formation of carbonic acid again from the carbonic oxide ($2CO = C + CO_2$) in the colder parts of the generator be effectively prevented.

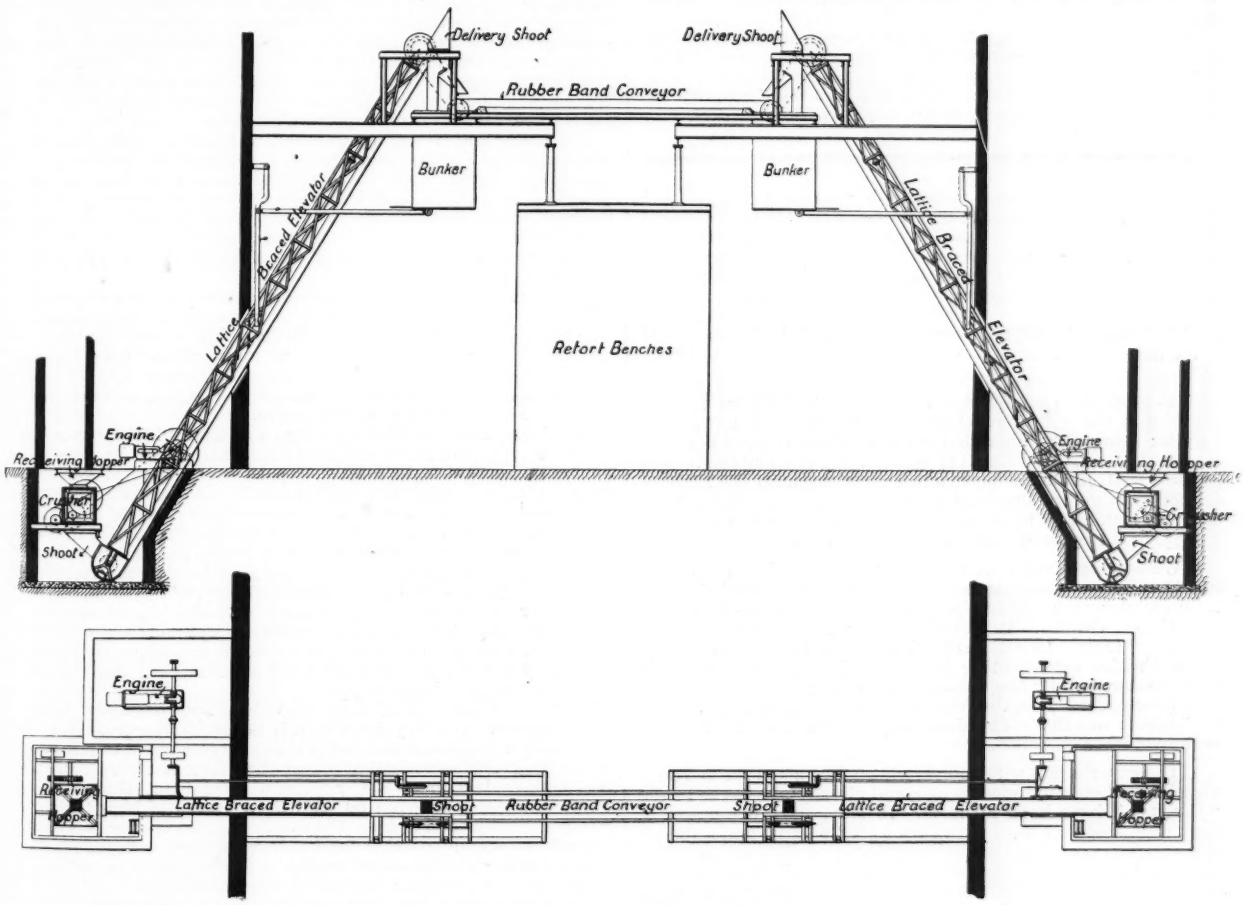
A NEW COAL-HANDLING PLANT FOR SYDNEY.

To-day it is claimed for Sydney that it ranks as the third city in the Empire, estimating on the basis of the annual rating value, though in the historical sense it is but as yester-year since Captain Phillips pitched his tents at the head of the Tank Stream under primeval trees, and as yesterday since the population and the new era came with the gold discovery. It has been calculated that the quantity of coal available in New South Wales, at the most modest estimate, is 115,346,880,000 tons; and frequent analyses of the coal in the neighbourhood of Sydney all serve to show that it is of a good quality and suitable for steam raising and smelting purposes. The depth of some of the measures underlying Sydney is so great that there is said, on good authority, to be very little danger of their ever being worked out. New shafts are continually being sunk, and plant of the most modern description erected; while several collieries are already fitted up with the finest appliances for economical and efficient work, supplying Government railways and also the Navy with large quantities of superior steam coal.

But now to our immediate story of the supply and delivery of a fine duplicate coal-handling plant to the Australian Gaslight Company's Mortlake Gas-Works, Sydney, by Messrs. Graham, Morton and Co., of Leeds, and built to the designs of Mr. T. J. Bush, the Company's Chief Engineer. The Resident Engineer at the works is Mr. Bertram Stanway; and many English engineers will remember Mr. Stanway when he was an assistant to Mr. Herring, during his construction of the Granton Gas-Works. The contract (which has just been successfully carried out) included the supply and delivery of two receiving hoppers, two standard four-roll crushers, two 12-inch lattice-braced elevators, two 16-inch rubber belt conveyors, two coal-bunkers with the necessary structure for supporting them, and two 17½-brake horse power steam-engines with the requisite shafting and gearing for driving the entire plant.

The hoppers are built up of ¼-inch plate, supported by means of 6 in. by 2½ in. channels, built into the side walls of the pit and attached to the hoppers by means of angle-iron framing. The two standard four-roll crushers are built up of steel side and end plates, firmly bolted together, and provided with shafts, cast-steel tooth rollers, guide plates, and the requisite gearing, &c., for working them. The structure on which they are supported consists of 8 in. by 3½ in. channels, built into the wall at one end, and supported by 8 in. by 6 in. cross joists at the other. The crushers are, of course, securely bolted to the channels. The shoots provided for the elevator boots are constructed of $\frac{3}{16}$-inch plate throughout; the side plates being flanged and riveted to the ends —the result being in each case a very substantial piece of work.

The two elevators are of the 12-inch standard lattice-braced type, 58 feet between centres, and each consisting of a suitable cast-iron boot, in which is arranged the adjusting gear for taking up and adjusting the length of chain. A cased-in framework of angle-iron runners and angle-iron stanchions, lattice-braced throughout, completes the design. The driving and trailing end fittings are constituted of cast-iron sprocket wheels, mounted on



SYDNEY GAS-WORKS.—SECTIONAL ELEVATION OF THE RETORT-HOUSE, AND PLAN OF THE COMPLETE NEW COAL-HANDLING PLANT.

bright steel shafts, provided with the necessary pedestals and loose collars, and also with adjusting screws for taking up and adjusting the length of chain.

One strand of chain is supplied to each elevator, tightly stretched over the end drums, thereby forming a continuous travelling chain, to which, at intervals of 18 inches pitch, are attached the buckets and skidder-bars. One $\frac{3}{16}$-inch plate wrought-iron breeches shoot is provided to each elevator; being built up of $\frac{3}{16}$-inch plate, and arranged with flap-door, and spindle and lever mechanism, for diverting the coal, either on to the belt conveyor or into the coal-bunker, as may be desirable.

The coal-bunkers are of wrought iron, and built up of ¼-inch plate throughout, with 2½-inch angles in the corners. The butt joints of the plate are formed by means of 5 in. by 3 in. tee irons. Each bunker is fitted with a slide door, and operates in the easiest possible manner. The structure for supporting the bunkers, as mentioned, is provided complete, together with the necessary structure for supporting the elevators. The latter consists of 6 in. by 5 in. rolled steel joists, stiffened by lattice-bracing. Each of the elevator pits is covered by $\frac{5}{16}$-inch wrought-iron chequer-plates suitably supported; and access to the pits is obtained by ladders about 13 feet long.

The belt conveyor is 30 ft. 6 in. between centres. It consists of two end drums, made up of cast-iron sides, with wrought-iron body plates, each drum mounted on its shaft, and the trailing shaft working with adjustable ends, and fitted with adjusting screws for tightening the belt. The belt itself is of the well-known Graham rubber type—flexible rubber and canvas of the finest quality, thickened with additional rubber in the centre portion, so that when the material is deposited in the trough line of the belt, it is carried on this increased portion of rubber. These belts are manufactured in large presses by experienced men; and

great care and attention are bestowed on the various processes of production, whereby the desirable ductility so necessary for obtaining the best results in working long lengths of belt is secured. On the top, or carrying side, of the belt it is supported by Graham's patent inclined idler rollers, made of cold drawn steel tubing, and fitted with hollow self-lubricating spindles throughout, adjusting blocks, &c. These rollers are pitched about 5 feet apart. On the bottom, or return side, the belt is supported by means of flat rollers, pitched 10 feet apart, mounted on 7 in. by 2 in. pitch pine battens, bolted to the structure. The belt drums—one central and two side drums—are built up of cast-iron centres with wrought-iron tubes, mounted on tube spindles, and provided with screw lubricators. They are placed at an angle of about 30°.

The structure supporting the belt conveyor is built up of 6 in. by 3 in. channel-iron runners, ultimately attached to the wrought-iron coal-bunkers. In addition to this belt conveyor, the contract covers the supply of a second conveyor, precisely similar, to replace the existing belt conveyor, should it at any time be desirable to do so—the plant being in duplicate. Another advantage of this duplication is the possibility of feeding either side of the retort-house from either plant.

Some mention of the gearing (which was also supplied by the Contractors) may be of interest. A short shaft is coupled on to the end of the engine shaft, from which, by means of a belt drive, a four-roll crusher is actuated. From the end of the same shaft, a second connected by gearing is carried up the side of the elevator, and by means of bevel gear drives the elevator. The belt conveyor is driven by means of a chain from the elevator-head shaft.

The engines for driving the machinery are each of 17½ brake horse power, of the horizontal type. The cylinders are 9 inches diameter by 12-inch stroke; and each runs at a speed of 140 revolutions per minute, and is capable of developing the horse power mentioned with 80 lbs. steam pressure.

An amended definition of the term "portland cement" has been adopted by the Association of German Portland Cement Manufacturers. It is defined to be a hydraulic cementing material of specific gravity not less than 3·1 in the calcined state, and containing not less than 1·7 parts by weight of lime to each one part of silica + alumina + iron oxide; the material being prepared by mixing the ingredients intimately, calcining them to not less than clinkering temperature, and then reducing the whole to the fineness of flour.

The annual report of the United States Geological Survey on the production of petroleum in the United States in 1903 shows that the output reached the large total of 100,461,337 barrels; being higher than that of any previous year, and greater than that of 1902 by 11,694,421 barrels, or 13·17 per cent. The greatest part of the increase during 1903 was from the State of California, which produced in that year nearly one-fourth of the entire output. The total value of the oil produced in 1903 was £18,938,810, compared with £14,235,780 in 1902.

We have received Part VI. of the "Technological and Scientific Dictionary" which is being published by George Newnes, Limited, under the editorship of Messrs. G. F. Goodchild, B.A., and C. F. Tweney. It extends from "Iron" to "Mauritius hemp." "Light" is not dealt with at any length, being considered under various other headings. Fair space is given to "Magnesium" and "Magnesium compounds;" but "Mantle" is only briefly alluded to, the fuller description being reserved for "Welsbach mantle." The dictionary will be a useful book of reference when complete.

The experiments with submerged coal commenced at Portsmouth about eighteen months ago, and already alluded to in the "JOURNAL," have been resumed. In May, 1903, five crates of coal, each holding 2 tons, were sunk in No. 2 basin, and a similar quantity was placed at the coaling-point in small heaps, covered with tarpaulins. Six months ago some of the submerged coal was raised and burnt, in conjunction with a similar quantity of that which had been kept on land; and the results showed that the submerged coal had greater calorific qualities. A similar test is to be made on the present occasion.

Special interest attaches to the report of the work done by the Imperial Physical Technical Institute during the past year, which has lately been published in the "Elektrotechnische Zeitschrift." It included a number of photometric tests of various kinds of lamps and accessories. The lowest consumption per mean spherical candle power (German unit) among the arc lamps with coloured arcs was found to be 0·37 watt. Osmium lamps were tested at 38 volts, and showed very economical figures, which, moreover, varied but little with time. Mention is made of the fact that in June the International Commission on Photometry appointed at the time of the Paris Exhibition of 1900 held a meeting at Zurich; the most interesting subject discussed being the fixing of the relative values of the light units employed in various countries. Though investigations with regard to this subject are still in progress, it was decided to fix the relative values temporarily as follows: One carcel lamp = 10·87 Hefner "candles;" one 10-candle pentane lamp = 11·4 Hefner "candles."

NAPHTHALENE REMOVAL.

By J. FERGUSON BELL, of Derby.

It was far from my intention to be unfair to Mr. William Young in my previous communication on this subject. It commenced with an appreciative acknowledgment of the valuable investigations undertaken by Mr. Young; and I must express my surprise that so experienced a contributor should not be able to discuss the question of naphthalene removal from coal gas without imputing intentional unfairness to one who happens to differ from him. But it would appear that to mention the word naphthalene, or cast a doubt upon the success of any process for its removal (especially if the process has the added virtue of being patented) is to bring upon oneself the reproach of being unscientific and unfair.

However, the leading fact remains that, although the Young and Glover patent (No. 20,125 of 1896) has been some eight years on trial, it has up to the present time—when tried outside the care of its foster parents—proved invariably a dismal failure; and after impartial trials at various works, with every desire to make it successful, it has sooner or later been discontinued.

For years the naphthalene difficulty has been for many a very real one; and if, as Mr. Young claims along with his colleagues, they have worked out a practical solution, there is little doubt that many engineers would have been only too glad to have permanently adopted the process. With reference to the saving to be effected by not having to remove naphthalene stoppages, my experience is that the "£ s. d." aspect is not of such great importance as the inconvenience attending the stoppages or partial stoppages of the gas supply, which causes consumers to be dissatisfied and tends to lead them to discontinue its use. A regular and uniform supply of gas of even composition both as regards illuminating and heating values is of the utmost importance if gas is to continue to hold its present position.

The Young and Glover specification, as I have already pointed out, consists of a general enunciation of known facts; most extensive claims being made therein. But no definite process is described, so as to be sufficient to enable anyone skilled in the business of gas manufacture to overcome by its use perplexing naphthalene stoppages, and even when adopted at a large up-to-date works under the direction of one of the patentees, it proved a complete failure.

The working of the process, as recommended by the patentees, has up to the present time been, in my opinion, unsuccessful because the solvent used, while having only a very moderate affinity for naphthalene vapours, removes at the same time valuable illuminants and other hydrocarbons which it is of the utmost importance should be retained in the gas, so as to be allowed to exert their selective affinities.

Mr. Young knows much better than I do that it is the removal of the last traces of impurities (and naphthalene may be classed as one, on account of its liability to pass from a state of vapour to a crystalline solid) that are generally the most difficult to accomplish; and it is now well known that unless active solvents of naphthalene with a similar vapour tension be present in the gas, then so small a quantity as 4 or 5 grains per 100 cubic feet will cause trouble, as when separation occurs below the melting point, it is precipitated in a voluminous crystalline form, often in familiar thin gossamer-like laminated crystals. So voluminous are the deposits that so small a quantity as 1½ grains will occupy $\frac{4}{10}$ths of a cubic inch of space, or sufficient to completely block a ½-inch pipe a distance of upwards of 2 inches, or if distributed enough to cause a dozen stoppages.

Now 100 cubic feet of coal gas weighs approximately (say) 25,000 grains. Hence 5 grains in this is almost inappreciable—being only 1 in 5000—and must of necessity be difficult to remove by washing with solvents that are at their best not very active, and become less so as they approach saturation. But all the time the washing is going on with the solvents of high boiling points recommended and used in the Young and Glover process, the gas is being denuded of naphthalene solvents, with the result that the desired effect (which was to be freedom from complaints arising from naphthalene stoppages) was not realized.

Mr. Young states that I am entirely wrong with regard to the amalgamation of the Young and Glover process with that devised by Mr. Leather and Mr. Wilfred Irwin. Well, I took my information from the pamphlet issued on naphthalene, describing the Young and Glover patent. Upon the introductory page there is an outline drawing of a heavy oil carburettor, which is very similar to the usual form of oil carburettor; and so far as I can see, it does not present any novel features. On the opposite page is a paragraph as follows:—

> These patents entirely cover the use of heavy oil in the treatment of naphthalene, or in extraction of same from coal gas. By arrangement with the proprietors of the above-mentioned patents, and with Messrs. Wilfred Irwin, of Manchester, and Mr. J. P. Leather, of Burnley (the owners of certain patented improvements), we are now prepared to advise engineers and consult managers of gas-works, where trouble is experienced with naphthalene deposits and to instal the necessary apparatus and supply suitable oils.

It is well known the suitable oils which have hitherto been supplied are creosote, heavy oils obtained from blast-furnace gases, and heavy petroleum, all of which I contend is a mistaken practice to use for washing out naphthalene from coal gas.

So that I may this time not be unwittingly unfair to Mr. Young,

I quote *in extenso* the claims said to be included in the Young and Glover patent, as stated in the second part of the first paragraph on p. 401 of the "JOURNAL" for Nov. 8, in Mr. Young's communication :—

> The specification of the patent for this process explains how that prior knowledge could be applied to do what had never been done before—how a supplementary supply of hydrocarbon vapours, or alternately carburetting or diffusing through the naphthalene-charged gas and vapours of hydrocarbon liquid solvents that would selectively condense out of the gas along with the naphthalene, and prevent it being deposited as a crystalline solid, or how to do both of the functions at the same time.

The first part claimed has not been accomplished by Mr. Young or his colleagues; and I have many times recently pointed out that the hydrocarbon liquids of high boiling points which they recommend and use, do not eliminate the naphthalene without at the same time washing out illuminants and valuable naphthalene solvents. And this has been the cause of failure in the practical application of the Young and Glover process.

Now as regards the second claim made by Mr. Young, of diffusing through the naphthalene charged gas the vapours of hydrocarbon liquid solvents that would selectively condense out of the gas with the naphthalene, and prevent its deposition in a solid form, this, as far as I am aware, has not been successfully done by Mr. Young and his colleagues. However, in view of the claim for a master patent by Mr. Young, I now give a further supplement to the extracts given in my last communication to the "JOURNAL"—

> So far back as 1856, the late Lewis Thompson, in the "JOURNAL," pointed out that if 10 per cent. of superior cannel be used with ordinary coal, the naphtha vapours will redissolve the naphthalene.

Your readers can compare this with Young and Glover's second claim in their patent No. 20,125 of 1896.

In the same year, Lewis Thompson, in a letter to the "JOURNAL," written in reply to many inquiries on the subject which is now interesting your readers, wrote thus—

> It is well known that the coal gas contains several kinds of hydrocarbon vapours which condense at different temperatures. . . . It follows that during the prevalence of medium or middle temperature—such as spring or autumn—the heavier hydrocarbons may condense, and the lighter ones pass on and remain in the gas. But naphthalene is the heaviest and most easily condensible of these hydrocarbons; and therefore we can have no difficulty in supposing that, during the prevalence of the middle (or spring and autumn) temperatures, the refrigeration of the gas may be just enough to permit of the condensation of naphthalene, *without, however, causing the condensation of the next hydrocarbon, which is naphtha*. Under these circumstances, the condensation of naphthalene in the gas will take place in the usual form of fine, light scales. . . . *But now with regard to the existence of a temperature sufficient to condense both the naphtha and naphthalene. In this case, the naphthalene does not crystallize, but is thrown down with the naphtha in a fluid, like rain, and flows off into the syphons.* . . . Hence we deduce a practical corollary, to the effect that if, during the prevalence of a middle temperature, naphthalene begins to show itself, we must surcharge the gas with naphtha vapour so as to *throw down even at that temperature a fluid compound consisting of naphtha and naphthalene.*

[The italics in the above quotation are mine.]

It will be seen that nearly half-a-century has elapsed since the above appeared in the "JOURNAL;" and surely it shows the absurdity of anyone claiming at this date a master patent for the use of hydrocarbon solvents.

It will be observed that Lewis Thompson negatives the assumption that naphthalene charged gas, on being subjected to a lower temperature, may be prevented from depositing its excess of naphthalene in a crystalline form by diffusing in the gas the vapours of active naphthalene solvents. He clearly perceived that only those vapours which separate and condense along with the naphthalene are available for the prevention of its deposition in a solid form.

It is clear to me that the extensive claims made in the Young and Glover patent were anticipated by other investigators; and I desire to make it clear that it is not my intention to acknowledge that the Derby process in any way comes within the scope of the Young and Glover or any other protected process.

Now as regards my reference to the Maxim carburettor. This occurred to me as an apt illustration of what had already been accomplished; and one of the claims made for this apparatus, in addition to enrichment, is: "This process also prevents the deposition of naphthalene in the mains and service pipes, carburine being a solvent for naphthalene."

For many years at Derby we have used a carburettor of this description; but, instead of using carburine for enrichment, we use 90 per cent. benzol, which is a good solvent of naphthalene. Owing, however, to its high vapour-tension, it rapidly diffuses through the gas, but condenses out some of the naphthalene vapour present along with the more condensible benzol, which is deposited in the syphon near to the carburettor. This as a matter of fact occurs with us whenever we are sending out naphthalene charged gas and carburetting it with benzol, and to this extent carburetting of coal gas with benzol vapours tends to diminish naphthalene stoppages, by the removal of a portion of the naphthalene which they selectively condense out of the gas, thereby preventing its precipitation in a crystalline form. But the supersaturation of illuminating gas with benzol vapours in order to remove the naphthalene present by condensation of these solvents, would be both costly and impracticable, because the benzol would, under certain conditions, cause the gas to burn with a smoky flame, owing to an excess of heavy hydrocarbon vapours.

To emphasize the difference between the Young and Glover process and the Derby process, I have only to refer Mr. Young to a letter in the "JOURNAL" for Oct. 25 last, from one of his colleagues, Mr. Thomas Glover, in which he states—

> The oil used for this purpose has the advantage of being free from sulphur, and can therefore be safely vaporized into the clean gas; and, although it is not in itself a powerful absorbent of naphthalene, by *acting on the xylene and other vapours in the gas*, it has proved both efficient and reliable.

The italics again are mine, as I desire your readers to note that Mr. Glover still clings to the use of oils which act upon the xylene and other vapours in the gas, which I unhesitatingly state is a mistaken and harmful procedure to adopt. The Derby process, on the other hand, adds xylene; and my process is essentially built up so that solvents of the benzene series may remain in the gas, and additional homologues which are active naphthalene solvents of the same series are added—instead of those valuable solvent vapours being eliminated—so that they may exert their selective influence upon the naphthalene present in the gas and thereby prevent its precipitation in a crystalline form.

Yet we are calmly asked to pay an acknowledgment by way of "lordship" to those who unwittingly have for so long given prominence to a fallacious procedure to be adopted for the removal of naphthalene stoppages. Whatever may have been Mr. Young's theories or deductions from investigations carried out by him, there is little doubt the practical application of them has so far as a naphthalene removal process is concerned has been a failure.

I yield to none in my admiration for Mr. Young's great abilities and self-denying labours towards the advancement upon scientific lines of the gas, oil, and kindred industries, which he so conspicuously adorns; but, while we admire, surely we may also differ.

THE BURNLEY PROCESS FOR THE REMOVAL OF NAPHTHALENE.

By WILFRED IRWIN.

While the naphthalene question is engaging the attention of the gas industry, perhaps I might refer to the process introduced a few years ago by Mr. Leather, of Burnley, and myself. It is, of course, like the other systems (with the exception of Mr. Botley's), a modification of the washing process of Young and Glover; but the special object of it is to keep the composition of the gas before and after treatment with oil the same for everything except naphthalene. For this purpose, a certain quantity of lighter hydrocarbons is mixed with the oil before treatment; and after the operation, which usually lasts until the oil contains 15 per cent. of naphthalene (extracted from the gas), the oil is heated with steam, and all the hydrocarbons of a lower boiling point than naphthalene are distilled off, and mixed with a fresh lot of oil for subsequent use. In this manner, all the naphthas which would otherwise have been extracted by the oil from the gas are allowed to pass forward. The process has been working at Burnley for the past five years, during which time almost every description of cheap hydrocarbon oil has been tried.

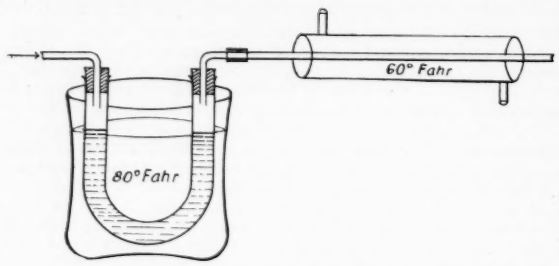
As Mr. Young has pointed out, there are two methods of attacking the naphthalene difficulty. The first is to apply to the gas the vapour of a liquid hydrocarbon possessing a vapour tension near to that of naphthalene, so that the two should condense together and the mixture be a liquid instead of a solid. The second is the process just referred to, of washing with oil. A combination of the two may, however, be employed by washing with an oil of the same, or nearly the same, vapour tension as naphthalene. This is what we have often tried to do; but we have been unable to obtain in this district a sufficient supply of such a coal tar fraction at a reasonable price, and free from naphthalene. With the same object in view, we have worked with the lower boiling fractions of "Scotch creosote," with medium success. At present, we are using coke-oven oils mixed with lighter hydrocarbons.

It may be remembered that, in order to place the matter on a quantitative basis, the writer made careful estimations of the vapour tension of naphthalene. This had never been previously attempted—or, at any rate, no record was to be found in the literature of the subject. He also showed how very rapidly the vapour tension increased with comparatively small increases in temperature, and also how a gas saturated with naphthalene would very readily deposit the same with a reduction in temperature. Besides acting as a guide to show how much naphthalene per 1000 cubic feet we may have to deal with, these experiments clearly demonstrated the cause of one of the greatest difficulties in regard to the subject, which is this—that the time when the mischief is being done by no means necessarily corresponds with the time when the trouble is being felt. Given that you have a gas free from the vapour of liquid hydrocarbons of the same or about the same vapour tension as naphthalene (which is usually the case with high-temperature carbonization), whether you have trouble in the services depends (1) upon the heat of the gas leaving the holder, (2) upon the temperature of the gas in the mains, and (3) upon the temperature of the gas in the services or street-burners.

The writer has shown that the vapour tension of naphthalene is such that, if the gas were cooled down to 32° Fahr. in the holder, practically no naphthalene would pass forward. At 50° Fahr.

the gas would still contain very little. At 60° Fahr. sensible quantities, and at 70° Fahr. comparatively large quantities would pass into the mains. In summer time, the temperature of the mains is usually below that of the holder, and also of the services. It is often also the case that the temperature of carbonization is higher in the summer than the winter; and hence the gas as it leaves the works is loaded with naphthalene, which however mostly deposits in the mains, and does not cause trouble, as the temperature of the services is higher than that of the mains. As cooler weather approaches, the temperature of the services, street-burners, &c., falls below that of the mains, and naphthalene complaints come in fast. To remedy this state of affairs, the gas engineer now tries the oil-washing process for a few weeks, and finds it to be of no service whatever, in spite of the fact that naphthalene accumulates in his oil; for he probably has quite enough in his mains to keep his services supplied with it for a whole season. Nay, unless he has added a fair quantity of hydrocarbons—such as solvent or heavy naphtha—to his oil, he may even be in a worse position than before, as Mr. Simmonds, of Bury, has pointed out; for then the oil, in addition to extracting the naphthalene, would also denude the gas of those naphthas which in some degree always act as a solvent for naphthalene deposited, and of which substance there would be certain to be enough in the mains to saturate the gas before it reached the services and be there re-deposited. As a temporary remedy, when the mains contain naphthalene, the writer recommends adding to the gas the vapour of heavy naphtha or other hydrocarbon with vapour tension as near as possible to that of naphthalene.

A useful laboratory experiment is the following: Take a U tube, fill it with naphthalene flakes and place it in a water bath kept at 80° Fahr. Fit it with corks, in which are glass tubes bent at right angles. To one of these tubes fix, with a small rubber tubing, another glass tube surrounded by a water condenser, and drawn out to a fine jet at the other end. Keep this condenser at (say) 60° or 70° Fahr., and pass a current of air or gas through the system, and note how very soon naphthalene is absorbed by the warm gas in the U tube and re-deposited at or near the outlet of the straight glass tube.



Another useful experiment to determine the nature and quantity of the less volatile hydrocarbons in coal gas is the following: Take a series of absorption bottles (say, four), and place in each 100 cc. of pure benzene. Through the system, pass gently (say) 100 cubic feet of the gas to be tested. Replace the benzene absorbed from time to time with fresh benzene. At the end of the operation, all the higher boiling hydrocarbons in the gas will have been absorbed, and can be determined by very careful fractional distillation; and from the residue, crystals of naphthalene itself may be obtained. It is unfortunate that the least volatile constituent of coal gas should be a solid at the ordinary temperature. If it is allowed to pass forward into the gas, it is of no use adding to the gas the vapour of any hydrocarbon less volatile than itself, as such a vapour would not carry; and, if the vapour of the hydrocarbons more volatile than itself be applied, they must be added in considerable quantity, or else they would remain as vapour when the naphthalene deposited. Such vapours include the heavy naphthas, the phenols, and the naphthalene hydrides, any or all of which added to the gas in sufficient quantity should prevent the deposition of naphthalene in solid form. This is the method suggested by Dr. Colman, who also (as a modification) proposes so to re-arrange the condensation at the works as to prevent the deposition in the tar of the naphthas already in the gas as much as possible. It is a modification of the naphtha process which has been in use for some years in Germany, and ought to be of service; but, to remove the naphthalene entirely from the gas before it leaves the works, appears to the writer to be the only right solution of the question.

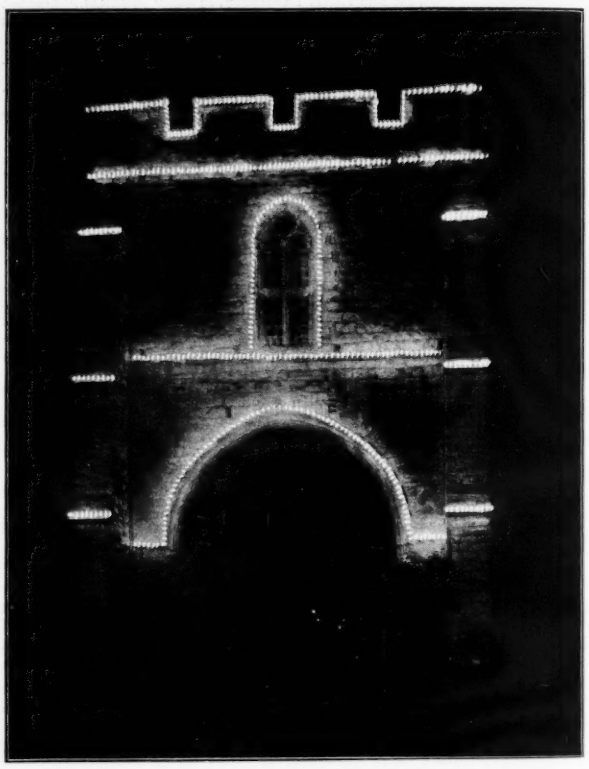
Mr. Fletcher W. Stevenson, the Gas Engineer to the Coventry Corporation, having received an invitation to fill the position of Vice-President of the Midland Association of Gas Managers for the ensuing year (and to which position he was duly elected on Saturday), the Gas Committee have not only consented to Mr. Stevenson accepting the vice-presidency, but have decided that, in the event of his being President the following year, an invitation should be addressed to the Association to visit Coventry during his term of office.

COAL GAS FOR GENERAL PHOTOGRAPHY.

By T. Ebenezer Pye. (Illustrated by E. W. H. Rolfe.)

The photographing of special installations of gas lighting has time and again been referred to and excellently illustrated in the "Journal," some exceptionally good examples of which appear in the last (Exhibition) issue. But general photographing by gas-light has not been nearly so well investigated. The actinic properties of incandescent gas-light rays are by no means appreciated to the extent their value would justify. It is, in fact, comparatively little known that, whereas the light from the ordinary yellow flat flame of coal gas is very poor in those properties essential to the photographer's art, in incandescent gas-light there is an ally the importance and value of which it is difficult to approximate. To gas managers (many of whom are themselves ardent amateurs in photography, and whose work has attained to a high degree of excellence) this subject will have a fascination, not only from the point of view of a personal and delightful hobby, but because it opens out possibilities of quite new business—of fresh fields which hitherto have been but very little thought of.

There is no doubt that considerable research and experimental work has been carried on in connection with the subject, but (with the modesty so characteristic of the true student of science) such researches are not made public. If they were, there are



The "Westgate," Canterbury, on a Night of the Cricket Week, 1904.

(From a photograph by Mr. E. W. H. Rolfe, of Sandwich.)

many gas engineers and managers who might contribute most useful and interesting data, to the benefit of their *confrères* and of the public generally. It is with some such idea that the present article is written, and also with a view to elicit suggestions from experienced amateurs among gas managers. A comprehensive collection of these would prove extremely valuable to the gas profession as a whole; and the author much hopes that a spirited discussion will ensue.

One of the accompanying photographs is of a number that have quite recently been taken by the writer and his friend, Mr. E. W. H. Rolfe, solely by means of gas-light. In this particular instance (the exposure being given about midnight, and no daylight or other illuminant whatever being employed) the lights themselves were kept out of the angle of view of the lens. The lighting at this corner of the Exhibition Hall (owing to circumstances beyond the control of the writer) was not as uniform as could have been desired. It will, however, be observed that, in spite of this, all important shadows are suppressed. The picture is in any case sufficient to be suggestive; and others will be submitted in a future article.

In the meantime, it would be highly interesting to learn how far the constitution of the mantles used, their age, or other developments attending their continued employment—whether

A Flower Stall taken by Gaslight at Midnight.

(From a photograph by Mr. E. W. H. Rolfe, of Sandwich.)

under intensified combustion or under more normal conditions &c.—will bear on the subject of their successful employment for photographic purposes; these certainly being matters well suited and worthy of careful research. Information will also be required on the matters of lenses, exposures, methods of developing negatives from gas-light made exposures, and the best means to be employed for printing from these negatives by gas-light, &c. Another point of interest—and one very important to the successful adopton of gas for these purposes—will be the suppression or toning down of such of the light units as may of necessity come within the view of the lens, and therefore into the picture itself.

The second photograph reproduced, which was taken during "Cricket week" at Canterbury, illustrates the gas illuminatious prepared by our friend Mr. H. C. Page, of the Canterbury Gas and Water Company, on the historic West Gate of that ancient city. Here we have an instance of a soft diffused light from a great number of low-power units, the vertical plane of which was directly parallel with that of the photographic plate. A comparison of the results of such conditions, with those obtaining from a system consisting of a limited number of high-power units, is very interesting and instructive, as will be illustrated in a future article.

ELECTRICITY, COAL GAS, AND PRODUCER GAS: ITS RELATIVE COST FOR POWER.

By H. J. Ibbotson, of Newport, I.W.

By the courtesy of Messrs. Mew, Langton, and Co., brewers, of Newport (I.W.), I have been furnished with the following interesting figures, relating to the difference in cost of power between coal gas, electricity, and producer gas generated in a suction plant. The difference between coal gas and etectricity does not add anything to previous information on the matter; but the low cost of the producer gas is somewhat startling, and indicates a keener form of competition than is generally anticipated. The comparison is of considerable value, as in each case the test has extended over a period of 90 days. The load has been, as near as possible, uniform; and every care has been taken in obtaining reliable data.

The gas-engine, made by Messrs. Tangyes (J. S. size), was fixed in 1902, and is capable of developing 35 effective horse power and 40½ indicated horse power, with coal gas, at 180 revolutions per minute. With producer gas, the maximum effective horse power is 29, and the indicated horse power 35. The motor was supplied by the Edmundson Electric Corporation, and is marked: "Volts 480, amp. 52, revs. per minute 700." The current for the motor was supplied on the maximum demand system; and the termination of the 90 days' trial resulted in a charge of 1800 units at 4d. and 22,175 units at 1d.—*i.e.*, a total of 23,975 units, at an average cost of 1·225d. per unit. The machinery consists chiefly of several large drums used in the process of malting, and revolving very slowly. The brake horse power is taken at 18; and though this may have been subject to slight variation, the comparison cannot be seriously affected, as in the following statement the cost per brake horse power per hour is calculated on the average daily consumption.

	Rate.	Cost per Diem.	B.H.P.	Consumption per B.H.P.	Cost per B.H.P. per Hour
		s. d.			
Electricity . .	1·225d. per unit	27 2 4	18	·616 unit	·755d.
Coal gas. . .	3s. per 1000 c. ft.	21 7·2	18	16·66 c. ft.	·600d.
Producer gas .	22s. per ton	4 10·9			
	Extra labour	1 0			
		5 10·9	18	1·157 lbs.	·164d.

Average Consumption of 90 Days' Trial.

Electricity, 266·3 units; coal gas, 7·2 cubic feet; producer gas, 4 cwt. 1 qr. 24 lbs. anthracite.

It will be seen that the extra labour is taken at 1s. per day of 24 hours. This fairly represents the cost of charging the generator and raking out the ashes, as the plant is left unattended for periods of four hours. The generator has only been in use for four months, and has been worked with unskilled labour. It is believed that, with further experience, a slight reduction in the amount of anthracite used will be obtained. It will be noted that the engine, when working with coal gas, was only developing about half its maximum effective horse power; while with the producer gas the load could be increased by about 11 horse power. In the case of the electric motor there is a much smaller margin, as this was fixed at a later date than the gas-engine, and when the power required was more accurately known.

The trial shows that one Board of Trade unit of electricity is equal to 27¼ cubic feet of gas; but in connection with this matter it should be noted that the sale of gas at the special rate of 3s. per 1000 cubic feet for power is a much more satisfactory commercial transaction than the sale of electricity at 1¼d., or any other price per unit, in the Isle of Wight. The producer-gas plant has not been in use long enough to enable the cost of maintenance or depreciation to be ascertained; but if this is balanced against the increased efficiency that should result with more familiarity of the plant, it is shown that the cost of working is cheaper than coal gas at 10d. per 1000 cubic feet.

The calorific power of the producer gas is stated as being from 140 to 150 B.T.U. per cubic foot. I regret that there is no information as to the heat value of the coal gas; but as the quantity consumed per brake horse power was only 16·66 cubic feet, this must have been about normal.

A donor, who desires to remain anonymous, has placed a sum of £1000 in the hands of the Treasurer of the Royal Society, to be devoted to the advancement of science. By his wish, £500 of this gift is to be placed to the credit of the "Catalogue of Scientific Papers Account," and the remainder to the credit of the "National Physical Laboratory Account," with the request that the Executive Committee of the Laboratory will accede to any personal wish of the Director as to its expenditure.

A CHURCH INTERIOR PHOTOGRAPHED BY GASLIGHT.

This photograph—sent by Mr. Herbert Buckley, the Engineer of the Windsor Royal Gaslight Company—shows the interior of the Roman Catholic Church attended by the King and Queen of Portugal last Sunday week. It has recently been fitted up by the Gas Company with Humphrey lamps, in four-burner clusters. The arrangement has given entire satisfaction to the Church authorities. The photographic plate was allowed an exposure of 30 minutes.

COPPER SULPHATE AS A GERMICIDE.

In the course of a paper presented to the American Chemical Society by Mr. D. D. Jackson, the Chemist in charge of the Mount Prospect Laboratory in Brooklyn, he expressed a favourable opinion on the use of copper sulphate for the destruction of algæ in water and also as a germicide. It appears from an abstract of the paper contained in a recent number of the "Engineering Record," that during the past few months more than fifty different sources of supply throughout the United States have been treated by this method, and the results obtained have exceeded all expectations. Both as an algæcide and as a germicide the chemical is remarkable. The micro-organisms which cause the greatest amount of trouble from tastes and odours in water supplies are those which are most effectively acted upon by this treatment. The bacteria which are of intestinal origin are also killed off with much higher dilutions than the ordinary germs. The use of covered reservoirs to prevent microscopic growths will no longer be a necessity, as the copper sulphate treatment may be applied once or twice a year and prevent all trouble. The dilution required for this treatment is usually about one part of copper sulphate to 8 million parts of water. This dilution is so great that, in order to obtain a medicinal dose of the chemical, it would be necessary for an individual to drink about 40 gallons of water a day. After two or three days the copper is absolutely removed by precipitation. The Department of Water Supply and the Department of Parks of New York City both had waters treated by the author during the past summer, with decided success; and in each case only one treatment, extending for a period of an hour, was necessary. The sulphate is applied by rowing over the surface of the water a boat from the sides of which are suspended bags containing the crystals of copper sulphate. These are dissolved in the water as the boat moves along. The use of copper sulphate as a germicide is being very extensively investigated, and it is probable that typhoid fever will be entirely removed from any source of supply by a dilution of one part of copper sulphate to 2 million parts of water. In this case, it is desirable to treat the polluted streams or portions of the supply at the source of the contamination. This method of treating water is being studied by the Massachusetts State Board of Health; one of the chief objects being to determine what becomes of the copper added to the water. The results will not be published for some months, owing to the time required to bring them to an authoritative conclusion.

A MECHANICAL FRENCH EXCAVATOR.

The great extension which has taken place in the length of mains for gas, water, and electricity, and the more general employment of drains and irrigation channels, have led to the demand for a machine as a substitute for digging by hand; thus economizing time and labour. In order to ensure success, such a machine must work not only when conditions are favourable—*i.e.*, in clayey soil—but also in hard, rocky earth. It must be powerful enough to dig trenches notwithstanding the presence of roots, gravel, and stones, and work equally well in all seasons. It is claimed that these conditions are fulfilled by the "Aurora" excavator, a description of which appears in the current issue of "Technologie Sanitaire." The machine is in the form of a road locomotive. The excavating wheel is at the back, and projects. It has a conveyor to take out the earth on the side of the trench at the required distance, or lift it into carts or waggons. It is said that the sides of the trench thus made are clean, and that the bottom is quite level, though the forward movement of the excavator is rather rapid—the average rate being rather more than 6 feet per minute. Recently, at Antwerp, the excavator dug, at the rate of 7 ft. 9 in. per minute, a trench 20 inches wide and 4 ft. 3 in. deep, corresponding to a removal of 123 cubic yards per hour. A peculiarity of the machine is stated to be that it can dig paved or macadamized roads without previous removal of the paving or macadam. As the excavator only consumes on an average about 10 cwt. of coal per day, and only requires one engineman and two assistants, and as the knives have only to be sharpened occasionally, there is evidently economy in the use of the machine. A contractor would be able with it to execute work for one-third or even one-fourth the cost of manual labour, and also save considerable time—an important matter in many contracts. In addition to excavating, the machine can be utilized in a yard as a traction-engine or ordinary locomotive.

The value of the natural gas production in the United States last year is estimated at £7,163,072, which is an increase of 16 per cent. over the previous twelve months. There were large gains in Pennsylvania, in Ohio, and in West Virginia. The volume of the gas produced is estimated at 238,769 million cubic feet. Its heating value would equal approximately that of about 12 million tons of good bituminous coal.

THE INSTITUTION OF GAS ENGINEERS.

A Special General Meeting of the Institution of Gas Engineers was held last Saturday in the Lecture Hall of the International Gas Exhibition, Earl's Court—under the presidency of Mr. D. IRVING, of Bristol—for the purpose of considering two resolutions in connection with the affiliation scheme. These resolutions (which were given in full in the "JOURNAL" for the 15th inst., p. 462) agreed to the affiliation of six named District Associations—and "of such other similar District Associations as the Council may from time to time resolve to admit"—with the Institution, and to consequential alterations in the Articles of Association. Those present at the meeting numbered about fifty.

AFFILIATION ACCOMPLISHED.

The SECRETARY (Mr. W. T. Dunn) having read the notice convening the meeting,

The PRESIDENT said he was very pleased indeed to see that such a large number of members were able to be present at the meeting. The business was of a purely formal character—namely, to give legal effect to the arrangements that had been made by the Council (and which had already been submitted to the members by circular) to complete the scheme of amalgamation with the District Associations. It was a matter of great satisfaction that they had succeeded in including in the scheme such a large number of the District Associations—namely, six. (Applause.) They could not but regret, and the Council did regret, that the scheme should not have been entirely complete. Through some circumstance, it seemed that their friends across the Border had not yet seen well to become affiliated with the Institution of Gas Engineers. Well, Scotchmen were usually so intelligent that he had very great hopes in them. Some slight misunderstandings that appeared to exist in their minds had so far prevented them from falling into line, so as to form one strong—he was going to say national, but one strong, comprehensive British Association, that would fully and ably represent the gas industry and the profession. He had, however, no doubt that in due time their friends over the Border, with their customary intelligence, would see their way to become affiliated, and thus complete the organization of the Institution of Gas Engineers. It was now his duty to move two resolutions. They were very long; and he proposed that the first—agreeing to the affiliation of Associations with the Institution—should be taken as read.

Mr. J. L. CHAPMAN (Harrow), however, said he thought it would be better to read it to the meeting.

The SECRETARY thereupon read the resolution.

The PRESIDENT then formally moved it.

Mr. D. TERRACE (Middlesbrough) said he had great pleasure in seconding the motion.

Mr. J. BALLANTYNE (Hamilton), in supporting the resolution, remarked that the President had referred to those of them across the Border. There was no doubt, perhaps, that Scotchmen were a little bit touchy at times; and he understood that the offence the Institution had given the North British Association was in terming them a District Association. The North British Association was a National Association; and this was probably one of the reasons why they refused to join the scheme. But he was very pleased to see that there was a loophole left in the motion—namely, that the Council might from time to time resolve to admit as affiliated Associations those who had not yet joined—and it was quite possible the North British Association might at some future time see their way to come in. He did all he could to get the Association to join; but unfortunately he was defeated in the matter. He, however, trusted that they would come forward, as he believed in union. Being associated in one body, they would have far more power in many ways than by remaining as disunited units.

The PRESIDENT said that, so far as the Council were concerned, they were very anxious not to give offence to anyone—especially their Northern friends. He was sure no one could regard the Scotchman as being parochial. He was quite Imperialist in his ideas and practice, and quite cosmopolitan. It was his (the President's) hope that it would soon be necessary to submit another resolution at a general meeting to include their friends in the North, because there could be no doubt that, notwithstanding the great success of the International Gas Exhibition, and the great prosperity of the industry with which they were connected, it was necessary in the interests of the profession and of the industry that they should be thoroughly united.

The resolution was then put, and carried unanimously.

The PRESIDENT afterwards formally moved the second resolution, relating to the alteration of the Articles of Association.

The SECRETARY having read the resolution,

The SOLICITOR (Mr. H. A. Hood) said the President had asked him to explain a little point that had occurred to him in consequence of the remarks made by Mr. Ballantyne. In the resolution that had been passed, they used the expression "District Associations," and so on, throughout; and the same expression occurred in the second resolution which they had just heard read. He understood that the North British Association objected to the term "District" as a personal reflection on themselves, though other Associations, as they would see from the first paragraph of the first resolution, were, in fact, so-called District Associations—for instance, the Manchester District Institution of Gas Engineers. Well, he thought the best way of meeting the objection of the North British Association would be—and it would be quite in order—that from the resolution they had just heard read the word "District" should be omitted when coming before "Association." They were, of course, only dealing with the second resolution now—not the first. He took it that the member of the North British Association who had the honour to be on the Council would not object to be called a "District Member of the Council;" and therefore they should only strike out the word "District" in connection with the word "Association," and not in connection with the description of a "Member of the Council." Therefore when the President came to put this resolution, unless any member wished to raise an objection to the change, he thought it would be advisable, in order to meet the North British Association, that they should omit the word "District" (not from the first resolution, but from the second one, which would require confirmation, as it effected alterations in the Articles of Association), so that throughout the resolution the word "Association" would appear without the preceding word "District." Where the word "District" appeared before "Member of the Council," it would remain; wherever it appeared before "Association," it would come out.

The PRESIDENT moved the resolution as amended.

Mr. H. MORLEY (Cardiff) having formally seconded it,

The resolution was carried unanimously.

GAS TESTING COMMITTEE'S RECOMMENDATIONS—A MEMORIAL TO THE BOARD OF TRADE.

Mr. CHARLES HUNT (London) said that, at the request of the President, he had much pleasure in bringing before the members the question which arose at the conclusion of the general meeting of the Institution in June last, relating to the method of burning gas in the chimney when under test. They would recollect that one of the recommendations of the Committee of the Board of Trade was that the 5-foot rate of consumption should be reverted to. This was at once strongly objected to by everyone who understood the question; and a resolution of protest was passed at the June meeting. This was referred to the Council; and they had carefully gone into the matter, and had referred it to a Sub-Committee to consider and deal with. This Sub-Committee had met and discussed the subject; and they came to the conclusion that, in the interests of the gas industry generally, a memorial should be submitted to the Board of Trade embodying their opinion. This memorial had been drawn up, and had received the assent of the whole of the members of the Council. With their permission, he would read it. [Mr. Hunt then proceeded to read the memorial, the contents of which may be indicated to readers of the "JOURNAL" after it has been presented to the Board of Trade.] He might add that, in drawing up the memorial, they had been assisted by two members of the Committee—the Engineers of two of the largest Metropolitan Companies, who had furnished them with complete series of tests showing the effect of the use of a certain height of flame on their gases respectively. They therefore submitted the memorial with great confidence that it was likely to settle the question of testing once and for all—that the suggested method was a suitable one applicable to gases of varying qualities, whether made wholly from coal or a mixture of coal and water gas. He did not know that it was for them to obtain a resolution at this meeting.

The HON. SECRETARY (Mr. J. W. Helps): No, no.

Mr. HUNT (continuing) said they could not, however, restrain the members from an expression of their opinion if they saw fit, and it would strengthen the hands of the Council if they would do so.

The PRESIDENT said the Council thought that it would be wise to take this opportunity of letting the members know exactly what they had done in accordance with the resolution passed last June. The memorial could not be published before it had been presented; but the Council were very anxious that the members should have the fullest possible information before them as to the course of action they had been taking. He could only add that the memorial had received the unanimous approval of their very large Council, and express the hope that the application would be successful. This concluded the business; and he desired, on behalf of the Council, to tender to the members their hearty thanks for attending that morning in such large numbers. They had the satisfaction of duty performed; and he trusted they would be able to adjourn to the magnificent exhibition and enjoy the reward of coming up to town.

The rusting of hoops on wooden water-tanks is the usual cause of the failure of these structures. Another case of this sort, which recently destroyed the water tower of the Upper Sandusky Water-Works Company, illustrates the importance of keeping the hoops in good condition.

Among the awards of medals by the Council of the Royal Society this year, we notice the Copley Medal to Sir William Crookes, F.R.S., for his long-continued researches in spectroscopic chemistry, on electrical and mechanical phenomena in highly rarefied gases, on radio-active phenomena, and other subjects; and the Hughes Medal to Mr. [now Sir] Joseph Wilson Swan, for his invention of the electric incandescent lamp and various improvements in the practical applications of electricity

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

The General Meeting of the Association was held last Thursday in the Lecture Hall of the International Gas Exhibition, Earl's Court—Mr. DOUGLAS H. HELPS, the President, in the chair. There have been some large attendances of late years to record in connection with the Association's meetings, but this one is, in that respect, without precedent.

MINUTES OF LAST MEETING.

On the suggestion of the PRESIDENT, the minutes of the last meeting were taken as read, and confirmed.

ELECTION OF OFFICE-BEARERS—MR. HELPS AND THE SECRETARYSHIP.

The PRESIDENT said he had to propose that Mr. S. Carpenter, of Dorking, be elected President for the coming year. Though Mr. Carpenter was not in charge of such large works as those of some of the Past-Presidents, his works were certainly model ones; and the results obtained there were second to none. Only this time last year, Mr. Carpenter gave them an interesting paper on the advantages of a carburetted water-gas plant in comparatively small towns; and he (the President) was sure that the members would look forward with much pleasure to Mr. Carpenter's Presidential Address.

Mr. W. E. PRICE (Hampton Wick), in seconding, said he was certain Mr. Carpenter would make an excellent President.

The motion was unanimously carried.

Mr. CARPENTER thanked the members very sincerely for the honour they had done him. He could only say that, whether his Creator had blessed him with one, two, or ten talents, he should put them all to the best use in his year of office. As the President had hinted, they were not turning out 500 million cubic feet of gas a day at Dorking (laughter); but they tried to do their very best in the interests of consumers and Company alike.

Mr. CHARLES HUNT (London) proposed the election of Mr. F. W. Cross, of Lea Bridge, as Vice-President.

Mr. A. F. BROWNE (Vauxhall), in seconding, said they knew that Mr. Cross was a modern man, progressive in gas politics, and had distinguished himself somewhat with their friend the enemy—the electric light. He was, they all felt, a very suitable person to be their Vice-President.

The proposition was unanimously agreed to.

Mr. CROSS thanked the members heartily for the honour conferred upon him. Of course, in accepting the office of Vice-President, he had looked forward to the Presidentship. That was not a pleasant thing to look forward to for twelve months. However, he did trust that he should be able to carry on the work to the credit both of the Association and himself. He had accepted the office with great diffidence; for in looking down the list of the names of the members, he really thought that many should have come to the front of him. He was comparatively a young member; but he would do his best in the post to which they had elected him.

Mr. J. L. CHAPMAN (Harrow) said it was his pleasure to propose that Mr. J. W. Helps be the Secretary and Treasurer of the Association during the ensuing year. He did not know how Mr. Helps got through so much work as he did; but there was one thing which they all recognized—that the more he had to do, the better he did it.

Mr. R. BEYNON (Torquay) seconded the proposal, which was heartily carried.

The HON. SECRETARY, in responding, said he accepted the office not, he must say, on this occasion with every willingness, because he had some time ago informed the Committee that he would not offer himself again for re-election. But it was pointed out to him at the last meeting of the Committee, when the nominations were received, that if he would undertake the duties for one year more, they would not ask him again. It was on that understanding that he had accepted the office for a further year. He thanked them all for the honour they had done him in electing him to the position.

Mr. F. SMALLBONE (Woodford) proposed the election of Mr. Norton H. Humphrys and Mr. J. Paterson as members of the Committee.

Mr. J. TERRACE (Tottenham) seconded the motion, which was unanimously agreed to.

Mr. S. W. DURKIN (Southampton) moved, and Mr. S. CARPENTER seconded, the re-election of Mr. J. L. Chapman and Mr. A. Dougall as Auditors.

The motion was unanimously carried.

NEW MEMBERS.

Moved by the PRESIDENT, and seconded by Mr. J. PATERSON, the membership roll was extended by the election of the following gentlemen: Mr. H. Coleman Head, of Winchester; Mr. Douglas F. Colson, of Weymouth; and Mr. Samuel Smithard, of Broxbourne, Herts.

A REPORT FROM THE NAPHTHALENE SUB-COMMITTEE.

The PRESIDENT said the next business was to receive a report from the Naphthalene Sub-Committee. This had not been distributed, because, before making it public, it had to be considered by the members. He would ask the Hon. Secretary to read the report.

The HON. SECRETARY said he might say that to this question the Naphthalene Investigation Committee had given a great deal of time and attention; and it was decided at the last meeting that a report should be drawn up by the Committee for presentation at this meeting of the members of the Association. It was suggested, if the report was approved, that a copy should be sent to every member of the Association, with a request that the member should lay before his directors a circular-letter which would accompany the report, as well as a copy of the report itself. It was evident that their reason for doing this was because they had exhausted the funds which they had had at their disposal through the kindness of those gas companies who had subscribed to the funds. It had not been considered necessary to forward the report to the members until the suggested course had been adopted; and they would see it was scarcely wise to make the matter public, as it would have been, if the report had been sent out broadcast. The report was as follows:—

The Sub-Committee beg herewith to submit a summary of the work which has been carried out up to the present time in connection with the naphthalene inquiry instituted by the Southern District Association.

The aim of the investigation throughout has been to subject to a thorough study the conditions which exist in the cooling and condensing systems in use at various works, and the effect produced thereby on the naphthalene and other vapours in the gas, with the ultimate object of devising a method by which the gas shall be completely deprived of naphthalene with certainty by the time it leaves the condensers, under all the different conditions prevailing in various works, or, failing such complete removal, that the gas shall always contain a sufficient quantity of vapours of substances other than naphthalene (liquid at ordinary temperatures), which would separate out together with the naphthalene in such quantity that the product would be a liquid and not a solid. In either case the gas will then deposit no solid naphthalene in the subsequent manufacturing plant or during distribution.

That such a solution of the problem is possible is shown by the fact that in some works this condition of things already exists—no naphthalene being ever deposited either in the works or district of supply; while other works, with largely the same general conditions, are seriously troubled, either in the works or district or in both. At the outset, nothing was known with certainty as to the reasons for the immunity from trouble in the first-mentioned works.

Before the commencement of the investigation, much valuable work had already been done by many investigators on the subject; and this work has been continued by them and others during the past eighteen months, with the result that much light has been thrown on this complex question, and several processes have been devised which have been found efficacious in overcoming the difficulty—at any rate, under the conditions prevailing at certain works. The Committee desire to record their high appreciation of the work of, and their indebtedness to, these investigators, whose results have been always freely placed at their disposal. These processes for the most part consist in subjecting the gas to special treatment at some point subsequent to the condensers; whereas the object specially aimed at by the Committee has been, as stated above, to ascertain how to arrange the condensing system itself so as to overcome the difficulty, and by such means as may be generally applicable, and not suitable only for works where special conditions exist. It follows, therefore, that such an investigation cannot be confined to a single works, but must be carried out at a number of works where the conditions are in many respects different; and this can only be done by the co-operation of a number of undertakings, the governing bodies of which are willing to assist in the conduct of such a systematic inquiry as has been decided upon by the Southern District Association.

As a first step, the Committee issued a circular letter to every member of the Association, which he was requested to lay before his Directors or Committee, inviting them to subscribe towards a fund being raised to cover the costs of the investigation. This circular was followed by a second, containing a series of subjects relating to naphthalene on which special information was desired. In response to these circulars, the sum of £398 18s. was subscribed (part of this being contributed by undertakings not connected with the Association); and returns containing much valuable information were received from 88 undertakings. The latter replies were then tabulated; and after they had been thoroughly considered, the Committee decided to make a detailed investigation, as far as possible, of the conditions of carbonization and condensation at the works of six different companies, three of which were free from naphthalene complaints, while at the other three serious trouble existed. In one of the latter, only the district was affected; in the second, trouble occurred on the works, but was worse in the district; and at the third, serious stoppages occurred both in the manufacturing plant and in the distributing system. Many tests were made to determine the amount of naphthalene in the gas, especially during the summer and autumn months; and these are summarized in the accompanying table.

It will be seen that the reason for freedom from trouble in the case of the first three works is not due, in two cases at any rate, to the gas containing a smaller quantity of naphthalene, for the average quantity was higher in these cases than in some of the works where serious trouble was experienced. Determinations were therefore also made of the amount of vapours of substances other than naphthalene in the gas, and particularly of those boiling between 130-170° C.; and while such determinations cannot be regarded as absolutely accurate, they may be taken as giving fairly true comparative results, and are given in the

fifth column of the table. It will be seen that the quantity of such vapours is decidedly higher at the works where no naphthalene trouble is experienced.

Tests were also made to determine the quantity of such oils present in the average tar produced at the six works, and, as will be seen in the sixth column of the table, the tar produced at the works free from trouble with naphthalene also contained a larger quantity of those oils. In addition, it was found that at two of the works free from naphthalene trouble special conditions of condensation exist, which may have a distinct influence on the results. Thus at one works, the whole of the products of condensation separating in the condenser flows backwards *against* the current of gas, which is quite different from common practice; while at the second works, the gas, before entering the condensers, passes through a special apparatus, which largely removes the tar-fog carried along mechanically with the gas, thus preventing the latter from reaching the condensers.

In order to follow up these results, experiments were then instituted at several of the works to ascertain the effect of modifying the conditions in the condensers. At one works, arrangements were made to remove the tar-fog from the gas by a special separator, the general effect of which was to decrease the quantity of naphthalene left in the gas, and at the same time to increase the quantity of other useful vapours. At this works also, it was possible to arrange the condensers so that the products of condensation should flow either with or against the gas stream; and it was found that, with the latter method, rather better results were obtained, both as regards removal of naphthalene and retention of other vapours. The best results of all were given when the tar-fog was removed and the products of condensation allowed to flow backwards against the stream of gas, on the counter-current principle.

At another works where the quantity of vapours in the gas (other than naphthalene) was very low, a long series of experiments has been conducted to ascertain the effect of specially introducing such oils into the condenser; many variations having been made in the point at which such vapours were added and in their amount. It was found that in this manner a reduction in the quantity of naphthalene was brought about, but that the amount of such reduction was very variable from time to time. On some occasions the removal had been almost completely effected with a very small quantity of oil; but it has not yet been found possible to so regulate the conditions that this result can be obtained for any length of time.

Tests of carburetted water gas have also been made on similar lines at four of the six works where this gas is manufactured. The amount of naphthalene was found to vary very greatly, and at some works was as high as that found in the coal gas, while at others it was much lower. As is well known, the quantity of vapours in carburetted water gas is much greater than in coal gas; but the quantitative tests on this point have shown that, with carburetted water gas of the same candle power, made at different works, the actual quantity of such vapours varies very greatly, differing in some cases by as much as 100 per cent. This difference probably accounts for the fact that in some towns the introduction of carburetted water gas has largely diminished naphthalene trouble, while at others no such benefit has resulted.

The Committee believe that it is possible, by submitting the gas to treatment in a condenser, designed to embody the principles indicated by the results of the investigation as most suitable for the attainment of the desired end, to eliminate the naphthalene to such an extent as to prevent any further trouble from it. It is obvious that if this can be achieved, it would be the most satisfactory solution of the difficulty; for it would be automatic and inexpensive. The Committee are therefore of opinion that it is desirable to erect such a condenser at one of the works, where the trouble is great, large enough to represent the conditions of ordinary manufacture. This would be arranged to deal with a considerable proportion of the gas as it left the retort-house; and the results obtained would be compared with those from the remainder of the gas after passing through the existing condensers.

The Committee believe that this is the most promising direction in which to pursue the inquiry. But it is impossible to proceed further at present, inasmuch as the funds at their disposal are exhausted; and they therefore appeal to the various gas undertakings, through the members of the Association, for further assistance in this respect, as they feel that work on the lines indicated is absolutely necessary, and will finally yield results which will amply justify the expenditure.

TABLE.

Works.	Naphthalene in Gas. Grains per 100 Cubic Feet.			Vapours in Gas of Liquids Boiling between 130–170° C.	Oils in Tar Boiling between 130–170° C.
	Max.	Min.	Average.	cc. per 100 Cub. Ft.	cc. per lb.
A	10·9	3·4	6·6	6·0	3·6
B	16·8	10·4	13·7	5·0	3·7
C	17·3	3·1	10·4	7·2	3·8
D	13·6	4·1	7·5	3·2	2·6
E	15·0	6·2	11·0	4·6	2·6
F	20·9	16·9	18·3	4·4	2.5

Now the question, continued Mr. Helps, which the President and the Committee asked the members to decide was whether they agreed, in the first place, with the report, which gave a succinct and careful account of the work carried out by the Committee during the past year or so. If they so agreed, then the Committee asked the members to decide whether they would adopt the suggestion that each member of the Association should be supplied with a copy of the report, together with a letter asking him to do what he possibly could by laying it before his directors with the object of getting them to subscribe to the funds which were necessary if they were to carry the investigation further. The question had also arisen as to whether, the investigation having got so far, they might not go a little further afield. This was a subject which interested not only the members of the Southern Association, but members of all gas undertakings, whether directors or engineers, throughout the United Kingdom. The idea had therefore been suggested—and it was with the object of getting the views of the members on the point that the report was brought up—that they should try and get the controlling undertakings other than those included in the Association's own list to help them in this matter. It was an investigation that could not be carried out without the expenditure of a good deal of money. The Committee and their adviser (Dr. Colman) did believe that it was a very promising direction in which they were working; and they did think that, if they were going to do away with this bugbear of naphthalene, they should do away with it as early as possible in the gas plant system. It was far better to do it in the condensers than in the washers afterwards. What they wanted now was not a discussion on naphthalene, but suggestions as to the lines on which the Naphthalene Committee should deal with this report.

Mr. CHAPMAN, to put the matter in order, proposed that, in the first place, the report of the Committee should be adopted, and that they should have it printed and sent round to all the members, with a letter asking help from their directors and committees; and then, further, that it should be sent out to others who might be interested in the matter. He felt that the members were very much indebted to the Committee and Dr. Colman for the considerable trouble that had been taken in carrying on this work.

Mr. CHARLES HUNT, in seconding the motion, said the report was admirable; and the suggestion a most practical one. The only question he should like to ask was as to whether the Committee had formed any idea regarding the amount of money that would be required.

The PRESIDENT said he did not think the Committee had considered the question as to the amount of money that would be required. He understood that Mr. Chapman proposed that the report should be sent not only to the members of the Association, but also to gas engineers and managers generally.

Mr. CHAPMAN: To such as the Committee think wise.

The PRESIDENT: I think it would be better to leave it like that.

Mr. F. W. CROSS said he should like to suggest, in connection with the circularizing, that it would be better to approach other Associations, and that the report should be read to the members of those Associations, with a request that they should bring the matter before their directors and committees as coming from their respective Associations.

Mr. HUNT remarked that he was not quite sure that he agreed with the limitation that was proposed. He thought the report was of such a clear character that it might be sent to all gas managers, with an explanation that the proposal was one the expense of which ought not to fall upon a single Association, and therefore subscriptions were invited generally.

The PRESIDENT said the resolution as placed before the meeting gave the Committee power to distribute the report to all the members of the Association, and also to other engineers.

On the suggestion of the HON. SECRETARY, the proposals were divided; and the resolution was first put, approving of the report, and instructing that it be sent out, with a circular-letter, to the members of the Association.

Mr. CROSS then proposed that first a copy of the report be forwarded to the Institution of Gas Engineers, asking for a subscription towards the work; and, secondly, that the report should be sent to the Secretaries of the various other District Associations, asking them to discuss it and the question of subscriptions, with a view to the members laying the matter before their boards and committees.

Mr. ARTHUR VALON seconded the motion.

Mr. HUNT inquired the object of sending the report to the Institution.

The PRESIDENT: For the purpose of getting money.

Mr. HUNT: Has the Institution any money to spare?

Mr. D. BRUCE ANDERSON asked if the Committee really had any idea what further sum would be wanted. Would it be as much as before, or less? How much, for instance, was the condenser to cost? If they could have this information, it would guide the members as to what they were wished to subscribe.

Dr. COLMAN said it was an exceedingly difficult thing to make any estimate at present as to what amount of money they would require. The suggestion was, as the members had seen in the report, to erect an experimental condenser of sufficient magnitude to represent manufacturing conditions; and it was rather difficult to say, without going into it in some detail, what sum of money they would need in the first instance for the erection of such a condenser. It was hardly to be supposed that the first condenser that was erected on these plans would really succeed in overcoming the difficulty. Probably, after the first experimental work, they would have to spend money upon altering the plant; and, on this account, the original outlay which was made for the fresh apparatus would not by any means represent the total sum which would have to be expended before success was obtained. Therefore, he felt that it was difficult to say what amount of money would be needed. Probably, if they could get an amount similar to what they had already had—say, about £400—they would be able to commence their investigations; but he

should feel that it would be very rash to state that, even with this sum, they would come to a satisfactory conclusion.

Mr. W. E. PRICE did not think they need worry themselves much about the sum they would want. The matter might be put in this way: The amount they were likely to get was not as much as they would require. Therefore he thought that, if they asked for as much as possible to be subscribed, probably they would not then have enough to go right through with the work.

Mr. BEYNON asked if the Committee proposed to render an account as to how the money had been spent up to the present. This might be helpful in getting in further subscriptions.

The HON. SECRETARY replied that there would be no difficulty in including in the report a statement as to how the money had been expended. It seemed to him that Mr. Cross's suggestion was an extremely good one. There was only one point which appeared to him (Mr. Helps) to be somewhat doubtful; and that was as to why they should go to the Institution. Of course, in going to the Institution with a suggestion that they should send out and ask their members to lay this matter before their directors, there would be much overlapping, seeing that they would be doing the same thing through the District Associations. What he supposed Mr. Cross really proposed was that the Institution should be asked to vote a certain sum out of their funds for the purpose. There was a little uncertainty as to how the Institution would take it. They might say: "Don't you think, if you want us to help you in this matter, that it is a subject you might hand over to us entirely?" Would it not be better to keep this a District Association affair, so far as they could, by approaching other District Associations in the first place; and then, if they could not get what they wanted (which he estimated roughly at £1000), they could go to the Institution afterwards?

Mr. HUNT thought the difficulty was that any contributions the Institution might make would come out of the subscriptions of the members of the Institution. He fully agreed that, in the first place, it was desirable to appeal to the District Associations.

Mr. CROSS said they all knew the Institution had at their disposal funds that would not come out of the pockets of the members. If affiliation of the District Associations to the Institution meant anything, it was that they would expect, and ask for, help from the Institution.

Mr. CHAPMAN thought the funds of the Institution were being used a great deal for all sorts of valuable purposes at the present moment; and he did not see that there would be much left for work like this.

After some further discussion, Mr. Cross's resolution was further divided, with the result that it was decided not to, in the first place, approach the Institution, but to confine the appeal, in addition to the Southern Association, to members of other District Associations.

BOARD OF REVISION OF THE OHIO GASLIGHT ASSOCIATION.*

The HON. SECRETARY said he had received the following letter from Dr. Harrop, of Milwaukee, the Chairman of the Board of Revision of the Ohio Gaslight Association:

Dear Sir,—I imagine it is scarcely necessary to explain the objects sought to be attained by this Board since the notices in the "JOURNAL OF GAS LIGHTING," of Aug. 2 (p. 317) and Sept. 6 (p. 652). The accompanying circular will perhaps serve to make the matter clearer if any uncertainty still exists.

I should like to bring our undertaking to your attention with particular emphasis, pointing out that, if we succeed in producing a work of real merit, all gas men will benefit by the existence of an addition to gas literature such as we are planning, and asking that your society participate in the work with a view to making it as valuable as possible.

Any proposal from you outlining some plan of co-operation will be received with pleasure. For my own part, one single suggestion which has occurred to me, and may appeal favourably to you, is that this Board forward to you a list of topics on which further data or opinions are wanted (either because it has not been possible to get them discussed fully on this side of the water, or because the English aspect is different), and that these topics be assigned by you to such of your members as are best able to deal with them, for brief discussion.

Hoping that the Southern District Association will make a start in this work this year—I am, &c.,

H. B. HARROP.

This letter, said the Hon. Secretary, had been written in connection with a body that had been formed in America—the Board of Revision of the Ohio Gaslight Association. They had in America a system in vogue known as the question-box; and it had been in existence for some time. The suggestion was that the matter should now be carried somewhat further—viz., that the questions and answers that had been brought before the Association during the past few years should be carefully revised, and put into book form; and it was believed that, by this means, a volume giving a vast fund of very useful information on many subjects in connection with the gas industry would be put at the disposal of those interested all over America and everywhere else. The Board of Revision asked the assistance of the Southern Association, to enable them to make the information as complete as possible. He did not think the President would wish to have the matter fully discussed at this meeting—at any rate, only the general principles. The best suggestion, he thought, would be that the matter should be given favourable consideration, and be left for the Committee to go into, and present a report at a later meeting. The President had just suggested that it would be better still not to wait, but to let the Committee do what they could to help in this matter their friends on the other side, if it appeared to them practicable.

The PRESIDENT said they had heard a good deal of affiliation in England; and it seemed to him that they ought to welcome this invitation from across the water, and to do all they could to bind themselves into a larger brotherhood. He would suggest that the letter be left to the Committee to consider, giving them power if thought expedient, to agree to the suggestion.

Mr. BEYNON seconded the motion, which was agreed to.

This concluded the business part of the programme.

* Reference is made to this matter elsewhere to-day, p. 678.

The members shortly afterwards lunched together; the large company including Mr. John Coates, of Ottawa, and Mr. R. O. Thompson, of Melbourne. The afternoon and far into the evening were spent in making a tour of the exhibition, and in inspecting the exhibits.

MIDLAND ASSOCIATION OF GAS MANAGERS.

The Autumn General Meeting of this Association took place on Saturday last in the Lecture Hall of the International Gas Exhibition, Earl's Court; there being a very satisfactory attendance of members. Owing to a business engagement, the President (Mr. George Helps, of Nuneaton) was unable to be present at the opening of the proceedings; and the chair was therefore filled temporarily by the Vice-President, Mr. T. BERRIDGE, of Leamington. On Mr. Berridge's right hand, sat Mr. D. Irving, of Bristol, the President of the Institution of Gas Engineers.

Mr. C. MEIKLEJOHN (Rugby) said he had to apologize for the absence of Mr. A. Cooke, the Hon. Secretary, who had been laid up for several days as the result of a chill, and had asked him to take up the duties that day. He therefore read the minutes of the spring meeting at Nuneaton.

APPOINTMENT OF OFFICERS.—PROPOSED JUNIOR ASSOCIATION.

Mr. BERRIDGE remarked that the first business on the *agenda* was the appointment of officers for the ensuing year.

Mr. MEIKLEJOHN said that in the absence of the President of the Association, it gave him very great pleasure to propose that Mr. Berridge should be their President for next year. Mr. Berridge was a man well known to them, and to many others in the gas industry, and he was sure he would do credit to their choice, and be an honour to the Association.

Mr. CHARLES HUNT (London) seconded the proposal. He need add nothing, he said, to what Mr. Meiklejohn had remarked. Their choice could not have fallen upon a better man. Mr. Berridge had worked hard for the Association, and he had distinguished himself in the profession.

Mr. J. F. BELL (Derby) said that before the resolution was put he would, as one of the oldest friends of Mr. Berridge in the Midland Association, like to make a few remarks. He was in a position to say that Mr. Berridge was held in the highest respect, not only by the public generally, but by those who worked under him. For a number of years he was Assistant at Derby; and he (Mr. Bell) was sure that Mr. Berridge would regret with him that the late Mr. Charles Taylor was not there to speak of his great services. Since leaving Derby, Mr. Berridge had gone to Leamington, and had not only proved himself a capable Engineer, but had made many friends in the town. He was therefore very pleased to support the proposal.

The resolution was heartily agreed to.

Mr. BERRIDGE said he was much obliged to them, and should do his level-best. He was not a clever man, like many of those who had preceded him; but what he undertook to do, he tried with all his heart to accomplish. He hoped therefore that he would be successful in carrying out the duties of the office. He would like to appeal for more papers. It was not a creditable thing for the Midland Association to go two years with only two papers—one per year. He would also be very glad to see an endeavour made to form a Junior Association. There were now such organizations for assistants all over the kingdom, except in the Midlands; and he thought they ought to do something of the kind in their district. If any young men who might read in the papers of this suggestion would communicate with him, he would endeavour during his year of office to call them together and start an Association. They were very pleased that day to see the amalgamation of the Associations, and were proud to have the President of the Institution with them. The Midland Association gave him a hearty welcome. There was one thing he wanted to see tackled, and that was the revision and bringing of their rules up to date. They were excellent twenty years ago; but now that their Association was affiliated with the parent organization, they wanted to be a little more strict in calling the Committee meetings. They should have them fixed, and not call them merely at the President's request, when frequently many members were unable to attend. Then as to the admission of members, they wanted to make this more difficult, so that membership of the Midland Association might be appreciated a little bit more. He thanked them very much for having elected him President, and again assured them

that he would do his very best for the Association. He then proposed the appointment of Mr. Fletcher W. Stevenson, of Coventry, as Vice-President. He said that they were delighted when circumstances occurred that brought him back to the Midlands; and they were quite sure that seeing (as they might be privileged to do) his new works in progress of erection would be very much more beneficial to them than seeing them when completed. Mr. Stevenson came of a family highly respected in the gas profession—he believed his grandfather sixty or seventy years ago was Secretary to the Derby Gas Company—and all the family were held in the highest esteem.

Mr. THOMAS GLOVER (Norwich), in seconding the motion, said he was sure Mr. Stevenson would fill the position of Vice-President very well; and when his turn came to be President, they would have in him a most excellent man.

The resolution having been carried,

Mr. STEVENSON thanked the members very much for his election, and assured them that he would do anything he could to forward the interests of the Association. During his year of office as Vice-President, in any way he could help the President and Committee they should have his services for all they were worth.

On the motion of Mr. W. LANGFORD (Longton), seconded by Mr. W. S. MORLAND (Gloucester), Mr. W. R. Cooper, of Banbury, was re-elected Treasurer.

Mr. BERRIDGE said they ought also to congratulate Mr. Cooper on having been made an Alderman of Banbury. It was a very high office. (Applause.)

Mr. COOPER, in returning thanks, expressed the hope that he would have more work than ever to do for the Association.

Mr. BERRIDGE said he was sorry their esteemed President, Mr. Helps, who had done so much during his year of office, was detained in the city. It thus fell to his lot to propose that Mr. Meiklejohn be once more elected Secretary of the Association. Three years ago (after having for eleven or twelve years filled the position of Secretary to the entire satisfaction of the members), at their unanimous request, Mr. Meiklejohn went into one of the presidential chairs, on the distinct understanding that at the end of that time he would be re-elected Secretary. They were very pleased he had consented to take up the office once more. The Committee had decided to give Mr. Cooke (who had in the meantime so ably discharged the duties) a testimonial; and they would be shortly addressing to the members a circular asking them for contributions.

Mr. T. COLLETT (Dudley) seconded the motion; and it was carried unanimously.

Mr. MEIKLEJOHN said he was very much obliged to them for this mark of their continued confidence. Speaking for himself, he should have been only too glad had they been content to allow him to resume the rank of a private member; but as it was their desire, he was quite willing to do what he could in the interests of the Association, which he had, and always had had, very much at heart.

Mr. BERRIDGE remarked that there were three members of the Committee to be appointed—one in place of Mr. Stevenson, who had become Vice-President, and two in place of those who had retired in accordance with the rules.

Mr. BELL proposed that Mr. H. Fowler (Derby), Mr. T. E. Maddocks (Kettering), and Mr. S. O. Stephenson (Tipton) be appointed members of the Committee. They had all taken an active interest in the work of the Association; and he thought it was very proper that they should be placed on the Committee so that this interest might be continued, and perhaps enlarged. They wanted to bring new members forward; and he did not think they could do better than elect the three gentlemen named.

Mr. W. A. SAPEY (Tamworth) seconded the resolution, which was agreed to.

Proposed by Mr. GLOVER, and seconded by Mr. J. T. LEWIS (Wellingborough), Mr. Hughes and Mr. Morland were elected Auditors.

Mr. MORLAND briefly returned thanks.

NEW MEMBERS.

On the motion of Mr. J. S. CRANMER (Stratford-on-Avon) seconded by Mr. A. T. HARRIS (Market Harborough), the following two gentlemen were elected members of the Association: Mr. Benjamin Ely, of Pye Bridge, near Alfreton; and Mr. W. J. R. Baker, of Malvern.

THE ILLNESS OF SIR GEORGE LIVESEY.

Mr. BERRIDGE remarked that they had all been exceedingly sorry to hear of the serious illness of Sir George Livesey; and they would only be doing their duty if they passed a resolution of sympathy, and of congratulation on his recovery. Sir George was the head of the gas profession in England—almost in the world; and he was sure the members would be unanimously in favour of the resolution. He would ask Mr. Hunt, as a very old friend of Sir George, to second the proposition.

Mr. HUNT said he regarded it as a great privilege to second the motion. He need not add to what Mr. Berridge had said with regard to Sir George Livesey standing, as he did, at the head of his profession. He was sure they all sympathized with him very deeply in his enforced withdrawal at such a time as the present, and would heartily rejoice to see him once more among them.

The resolution was unanimously carried; and it was stated that a copy would be sent to Sir George Livesey.

At this point, the PRESIDENT (Mr. George Helps) arrived and took the chair.

THE SALTLEY EXPLOSION.

The PRESIDENT called upon Mr. Meiklejohn to read a letter he had received from Mr. Hack thanking the Association for the letter of sympathy sent by them in connection with the recent deplorable accident at Saltley.

Mr. MEIKLEJOHN read the letter, in which Mr. Hack thanked the Association for their expression of sympathy, and stated that the numerous messages received had had a soothing effect on himself and on his colleagues.

A FEW WORDS FROM THE PRESIDENT OF THE INSTITUTION.

The PRESIDENT thought that, as they were honoured that day by the presence of the President of the Institution, they might ask him to give them just a few words of encouragement—encouragement that would help them to get through the exhibition, and see all the vast progress that had been made during the last ten years. If they saw only what had been done in that time, it would give them sufficient to occupy the whole of the afternoon. He understood that they had there every latest form of apparatus for the use of gas for light, heat, or power; and doubtless the President would be able to point out some special features with regard to these three uses to which gas was at the present day put. Before sitting down, he should like, if he might, to apologize for having been away at the opening of the meeting. Unfortunately, a meeting which was originally fixed for Friday had had to be postponed for a day; and it was only with considerable trouble that he had succeeded in getting away when he did.

Mr. D. IRVING (the President of the Institution) said he was very much obliged to them for their kind reception, and would just like to offer one word of congratulation on the large number attending the meeting. The Midland Association, he might safely say, had always been regarded as certainly not the least useful of District Associations. Associations (and more especially District Associations) were not to be judged—their usefulness or benefits were not to be judged—by their published transactions but more by their useful associations, the friendships that were formed, and the meetings together, which were so helpful, and yet were not recorded. The President had suggested that he might say a word of encouragement to them. Well, there had been no meeting of gas engineers or officials lately that he had seen which was in any way depressed; and certainly the industry they represented was never in a more flourishing condition than at the present time. The exhibition that had been arranged under the patronage of the Institution of Gas Engineers was, he thought he might safely claim, one of the best and most comprehensive collections of gas apparatus for the purposes of light, heat, and power that had ever been brought together. The President had suggested that he might point out the special features; but this would occupy too long, and besides they were all very capable of judging for themselves. The most striking feature of the exhibition, however, was the high-pressure lighting, and the pleasing effect it had as distinguished from the electric arc light. Other great features were the cooking demonstrations and lectures. Everyone who had time should witness the preparation of the breakfast, consisting of toast, coffee, omelette, and bacon, which had been accomplished by some of the young ladies in less than twelve minutes, starting all cold. This was a most remarkable performance. The exhibition, he believed, was a fair indication of the present position of the gas industry. But he should just like to add that it was necessary for all who were interested in gas production and in the management of gas undertakings to recognize that the old days of ease and comfort with maximum dividends had departed, and that if they wished to preserve the prosperity and extend the uses of gas, they would have to devote to the task all the energy and all the ability of which they were possessed. He was pleased to think that the Midland Association and the Institution were at the present time amalgamating and bringing themselves into line, so as to secure concerted action, not only for protection, but for increased efficiency, and for the development of a right and true policy. The success that had been attained hitherto had been secured because gas undertakings had spared no pains or cost to promote the interests of the consumer; and he was satisfied this was the right policy to pursue, and that the interests of the proprietors could best be secured by looking after those of the consumer. He wished for the success of the Midland Association; and as for the industry generally, he could only wish that its present success might be assured.

The PRESIDENT said he was sure they were all very much obliged to Mr. Irving for coming there and making the remarks he had done.

This concluded the business of the meeting; and the members afterwards had lunch together in the exhibition.

North British Association of Gas Managers.—We have received from the Secretary (Mr. R. S. Carlow) the official report of the proceedings at the forty-third annual meeting of the Association, held in Glasgow in July, under the presidency of Mr. David Robertson, of Dunoon. It is accompanied, as usual, by the "Statistical Report of the Gas Supply of Scotland," by the Committee of the Association; the figures presented being for the twelve months ending Aug. 1 last.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

QUARTERLY MEETING IN MANCHESTER.

The 140th Quarterly Meeting of the Institution was held in the Mosley Hotel, Manchester, last Saturday—Mr. H. Townsend, of Wakefield (the President), in the chair.

The Hon. Secretary (Mr. H. Kendrick, of Stretford) read the minutes of the meeting held at Bradford on the 20th of September, and they were confirmed. It was announced that several members had written regretting their unavoidable absence.

The Late Mr. E. L. Newbigging.

The President said before commencing the business of the meeting, he would ask the members to pass a vote of condolence with Mr. Thomas Newbigging, their Treasurer, and Messrs. J. G. & W. Newbigging, two of their esteemed members, in the sad bereavement they had sustained during the preceding week by the death of Mr. E. L. Newbigging, of Macclesfield. It was sad to see a young life cut off just on the threshold of its usefulness.

The vote having been passed, the Secretary was requested to communicate it to the members of the deceased's family.

Appointment of Scrutineers.

Messrs. Shadbolt and Furniss were appointed Scrutineers of the ballot-papers.

International Gas Exhibition.

The President said, as the members would have seen from the announcement in the press, that Monday, December 9, had been fixed as the date of the formal visit of the Institution to the Earl's Court Exhibition. He was sorry to say that no arrangement advantageous to the members could be entered into with the Railway Companies for travelling to London in parties at reduced fares. It had been hoped that the meeting on the 9th would have synchronized with that of the Institution of Gas Engineers to confirm the alteration of the rules rendered necessary by the affiliation; but as the meeting to pass the resolution was taking place that afternoon, the confirmatory resolution could not be passed till Monday, Dec. 12; fourteen days' interval being required. It was, therefore, hoped that members going to London on the 9th would be able to remain over the 12th.

Mr. W. W. Hutchinson (Barnsley) suggested that the Council of the Institution of Gas Engineers should be communicated with, to prevent the meetings of the two Institutions clashing in the future.

The President pointed out that the business before the Institution of Gas Engineers that afternoon was purely formal.

Mr. W. Whatmough (Heywood) said he looked upon the Earl's Court Exhibition as a means of educating the public in gas matters; but as the general public in the North would not have an opportunity of visiting it, he thought it would be advisable if their Committee could arrange to have the lighting and heating part brought to Manchester—the great industrial centre of the North.

The President said it was impossible to deal with Mr. Whatmough's suggestion at the moment.

The Secretary announced that he had received a letter from Mr. Dunn pointing out that it would be very useful if as many members as possible could stay over the 12th of December to attend the confirmatory meeting. Arrangements would be made for the meeting to be held at eleven o'clock, so that those who wished could get away by the afternoon train. The Organizing Managers of the exhibition had written to say that the Welcome Club would be placed at the disposal of the members during their visit. He also referred to the unwillingness of the Railway Companies to meet the Institution on the subject of reduced fares.

The President said the meeting on the 9th of December would take place in the Welcome Club, at three o'clock.

Co-operation with the Ohio Revision Board.

The Secretary read a letter and circular from Dr. Harrop, in similar terms to those presented by him to Mr. Helps at the meeting of the Southern Association on the previous Thursday.

The President said all would be agreed that to carry out Dr. Harrop's suggestion would be of great help to the gas industry throughout the world. He proposed—"That this Institution cordially accepts Dr. Harrop's invitation to join the Ohio Revision Board in the production of a 'Question-Box;' and when this Board sent the various topics on which they wished to obtain the English views, the Institution would do its best to thresh them out, and obtain the best information to send to America."

Mr. S. R. Ogden (Blackburn) seconded the resolution. He regretted that the gas engineers of England had not already taken up the question. He did not know whether it would not be better to delegate the matter to a Special Committee; but this point might perhaps be left open.

The President said the resolution only committed the Institution to the principle; the details had already been considered by the Council.

Mr. W. Prince (Stoke-upon-Trent) asked if the matter had been under consideration by the Council of the Institution.

The President said it had. With reference to Mr. Ogden's suggestion, he said he did not think it necessary to form a Special Committee. He thought it might be safely left in the hands of the Council, who would probably make some suggestion at the next meeting.

The resolution was carried unanimously.

ADJOURNED DISCUSSION ON MR. NEWBIGGING'S PAPER ON "HORIZONTAL v. INCLINED RETORT INSTALLATIONS."

The President said the discussion on this paper had made a good start at the former meeting, but before resuming it he should like to say that these technical papers were really the life-blood of an Institution of the character of theirs; and they owed a debt of gratitude to the gentlemen who went to the trouble of preparing them. The discussion at the last meeting took rather a personal tone, which, he thought, was very much to be regretted. He would ask the members on the present occasion to leave the personal element entirely out of the discussion. The ancients used to advocate a combination of the *fortiter in re* with the *suaviter in modo*. The members of the Institution were not likely to neglect the former; but he thought, as a rule, they were rather inclined to forget the latter. If Lancashire and Yorkshire men paid a little more regard to it, it would be an improvement. Let them be as forcible as they liked, but at the same time they should be as gracious as possible.

Mr. J. G. Newbigging (Manchester) said, in re-introducing the paper which he had the pleasure of reading at the last meeting, he did not propose, before the discussion took place that day, to take up much time. Although at the last meeting only three members took part in the discussion, they had completely covered the ground; but since then he had been able to prepare something in reply, which he would submit to the meeting at the close of the discussion, when he would also deal with any further questions which might arise.

Mr. J. W. Morrison (Sheffield) said, being a strong advocate of stoking machinery, the paper had greatly interested him. In the first place, he wished to offer his sympathy to Mr. Newbigging for the peculiar position in which he was placed. He took it that he had come to Manchester and found works conducted in such a way that certain fresh methods became necessary, and that he had to select the best. He did not think the works could be put on a proper footing if Mr. Newbigging had to employ the number of men mentioned in his paper. Therefore, he supposed, he had to adopt a new system of working. He noticed, first of all, that Mr. Newbigging mentioned that there was a certain creeping of the coal; and from the information he had collected, he thought this put a very heavy handicap on the purchase of coal. In the Derby district, where they could obtain contracts for inclined retorts, they got heavier prices than they did when they had to sell the coal for horizontal retorts. He noticed that Mr. Newbigging put down the life of the horizontal retort as equal to that of the inclined, and that he gave 1000 days in most cases. In his experience, they had retorts that lasted 2000 to 3000 days; and they did not repair them when they found it would be more to their benefit to gut them entirely. Therefore, the 1·57d. put down as the cost of repairs and renewals must be doubled if the life of the retort was taken at only 1000 days; and this would bring the cost of the horizontal retorts to 3d. above that of inclines. With regard to the number of men employed for the horizontal retorts in Manchester, comparing it with Sheffield he found—ignoring such men as firemen and foreman and the coke handlers, who would be more or less common to either system—for dealing with 378 tons, he had practically 99⅔ men. In his case, to deal with 420 tons of coal he had 59 men. In Mr. Newbigging's case, the coal handled per man worked out at 3·8 tons; whereas in his case it worked out at 7·1 tons. So that Mr. Newbigging had 87 more men to do the same amount of work as they did at Sheffield. Therefore he thought there was something in connection with Mr. Newbigging's horizontal retorts that was radically wrong, comparing them with other works where they obtained better results. At Sheffield, they did not pay a low rate of wages; they paid the stokers 5s. 9d. a shift of eight hours. He noticed that in Manchester, in 1897, the selling price of gas was 2s. 3d., whereas in Sheffield it was 1s. 11d.; and from the last returns for Manchester it was 2s. 6·78d., whereas in Sheffield it was 1s. 8d. From this, he gathered that the consumers in the one place had lost to the extent of 7d. per 1000 cubic feet.

Mr. S. R. Ogden (Blackburn) remarked that the managers of corporation works could not hope to compete with works such as Mr. Morrison's, under the management of a company. In corporation works, they had a certain amount of the Socialist element on various councils, which militated very considerably against the working cost. It was not necessary for him further to expatiate on this topic; but he merely intervened to point out that, when they were making comparisons as to cost of working, it should

be remembered that it was not the cost of working which the manager of a corporation works would like, but what he was forced to adopt.

Mr. J. WILKINSON (Halifax) said, as one who had served both under companies and corporations, he could, to a certain extent, bear out what Mr. Ogden had said; but this had nothing to do with the question raised by the paper then being discussed—Which was the best system to adopt? He thoroughly appreciated Mr. Newbigging's position. There were in every works certain conditions which no new engineer could alter immediately. It was stated in the paper that, on making a fair comparison, the stoking machinery brought the cost out at 1s. 6·47d. per ton of coal carbonized, while in the same works in the same town with inclined retorts the carbonizing could be done for 1s. 2·33d. As one who had used, and was still using, both systems, his opinion was that, while Mr. Newbigging was able to carbonize with his inclined retorts for 1s. 2·33d. per ton of coal, he, who was able to work inclines at 11d., had no hesitation in saying that, were he to be called upon to make a further extension, he should certainly put in stoking machinery, and should abandon inclined retorts.

Mr. H. KENDRICK (Stretford) said that his remarks at the last meeting were not in criticism of the paper, but were really comparing the cost of hand-working on Mr. Newbigging's system. He had been working with practically the same men as Mr. Newbigging had, because they went backwards and forwards from Stretford to Manchester year by year; and he paid the same wages. So far as the figures he gave six months ago were concerned, he found that, with his manual machines at Stretford he was working quite as cheaply as, if not cheaper than, Mr. Newbigging under the conditions which he was forced to work with the power machines at the Bradford Road works of the Manchester Corporation. Taking this fact into consideration, and also the fact that at Stretford they were using nothing else but small coal, he considered that it would be very much cheaper indeed for him to continue his hand machines with horizontal retorts, using the same coal, than to adopt inclines. Still more would this be the case if, as Mr. Newbigging had pointed out, the cost of reconstructing the retort-house came to £122 per mouthpiece. The day before he had gone through his books, and got out the exact cost of a small retort-house of eight ovens, with 168 mouthpieces, built eight years ago at Stretford. What he was going to give were not estimates, but the actual cost of the buildings, paid to a contractor after the works were finished and measured up. For eight beds of eight mouthpieces the cost was £3952; the ovens, including all the ironwork, cost £6885; manual machines, including foundations, cost £2266—making a total of £13,103, or practically £80 per mouthpiece. These machines were capable, in his estimation, of dealing with sixteen ovens, not eight. He had two sets of drawing rakes and one charger. It was well known that a man with the manual charger could draw two retorts while the man with the other system was drawing one. When his houses were rebuilt, he intended to try and see if he could not work the sixteen ovens with one set of rakes. In that case, the cost would come out at £73 per mouthpiece. If an inclined retort house was going to cost £142, as stated by Mr. Newbigging, he could not see where the saving was, even if wages came out at half the price. But when, as he had pointed out, it meant a difference of 2s. a ton in the fuel that was used, it would result in a very considerable loss to the Stretford Gas-Works to adopt the inclined retort system.

Mr. T. DUXBURY (Oldham) remarked that he had been reported to have said, and perhaps he did, that he knew works that were doing the work at practically 100 per cent. less per ton of coal than Mr. Newbigging had given for Manchester. This could not possibly be; for, if so, they would be doing it for nothing. What he meant was that the work there was 100 per cent. more than at other works. The other correction that he thought it due to Mr. Newbigging to make was with regard to a statement to the effect that his estimate for the construction of inclined retorts for the same work as Mr. Newbigging's did was £84 per mouthpiece, and that for horizontal retorts was £64. At the time he referred to, they were just getting in their tenders for both systems; and he had had an opportunity lately of going through the exact figures of the tenders which he had received for the two classes of work. He thought it right to make the correction, and say that, taking the average price of the average tenders for their inclined retorts, it did not come out to £84, but rather that it came to pretty nearly Mr. Newbigging's figure of £75. He could not alter the figure he had given for the horizontal retorts, because the average price worked out, as he had stated, at £64. This figure he had taken from a job recently executed at his own works. He was sorry that the President thought there had been any personal element introduced into the former discussion. He wished *in toto* to refute any intention of being personal. He would not enter into any discussion for the sake of introducing into it personalities; and he thought the President ought not to have insinuated that this had been done, unless he knew as a fact that it was the case. As far as he was concerned, it was certainly not so. He said what he did simply because he had certain machinery to do the work which he had advocated to his Corporation; and he felt bound to show that he was fully justified in the advice he had given to his Committee. He hoped the members would believe him when he said that there was not the slightest personal feeling as far as he was concerned against the authors of the papers.

Mr. J. C. BELTON (Chester) did not intend to take up the unfair position of re-opening the discussion before the readers of the papers had had an opportunity of replying; but he wished to confirm what Mr. Duxbury had just said. He felt very hurt when the President said that personal feeling had been introduced into the discussion at the last meeting. He understood that papers were brought before Associations of this description for the purpose of being discussed; and if he brought a paper before the Institution, he should expect it to be torn to pieces, if it was tearable. Mr. Newbigging was a comparative stranger to him, he having only met him on a few occasions; and, to use almost the words of Mr. Duxbury, so far as he was concerned he had no personal feeling whatever in what he had said, and there was so far as he was aware no personality conveyed in the words he had used. If discussion was to be throttled by raising the cry of personalities when it was of a free character, he thought it could not but have a very injurious effect indeed on the meetings of the Association.

Mr. W. W. HUTCHINSON (Barnsley) wished to ask Mr. Newbigging whether, in view of the undoubted improvement in mechanical appliances for charging and discharging retorts, he would still recommend the use of inclined retorts, having regard both to cost of working and cost of charging in both cases.

Mr. H. HAWKINS (Todmorden) asked Mr. Newbigging whether he had adopted the method that he mentioned a few years ago of taking the gas off both at the top and bottom end of the retorts. He had found it a very great improvement, and was now about to complete an old setting of an installation of inclined retorts on this system. He made inquiries of Mr. Hack, of Birmingham, and found that he was about to adopt the same practice.

The PRESIDENT said inclined retorts did not seem to have a great many friends. As the members were aware, they had an installation of inclined retorts at Wakefield; and they did him the honour to come and look at it a few years ago. As he had explained on that occasion, those inclined retorts had been put in because, owing to the peculiarities of their site, they were obliged to get all the coke out on one side of the retort-house. But now, owing to the improvement in stoking machinery, and in coke-discharging rams, the coke could all be got out on one side of the retort-house in that way. So that this particular recommendation for inclined retorts was shared by the other system. There was one thing in Mr. Newbigging's paper which he had not heard anyone mention, and which he thought was of considerable value. Mr. Newbigging was fitting up the whole of one works with inclined retorts, while the whole of another works would be fitted up with stoking machinery; so that he would have a splendid opportunity of trying it on a large scale, and settling to demonstration which was the cheapest and best method. Another point touched on that afternoon was that, in making comparisons between one works and another, the local element and the ownership dominated the position very largely. For instance, there was no doubt that, in gas-works owned by corporations, other things besides political economy came into play, and the managers were not always their own masters. They had to be guided by other considerations than a pure question of market value. With regard to his opening remarks, he was sorry to find that he had trodden on the corns of two highly esteemed friends in using the word "personalities." He did not mean to give it such an interpretation as had unfortunately been placed upon it. He accepted their explanation; and he had no doubt it would be extremely satisfactory to everybody concerned. He would now ask Mr. Newbigging to reply upon the whole discussion.

Mr. J. G. NEWBIGGING (Manchester), in reply, said: When introducing my paper to your notice at our meeting in February last, I thought I made it quite clear that the results I then gave were those coming within my own experience; and I consider that it is the duty of any member of an Institution such as ours, when submitting a paper to his fellow-members, to give his experiences in the particular subject he may be dealing with exactly as he has found them, without fear or favour. I say this because complaint was made by one of the speakers at the last meeting that I had not made it clear that the figures I gave were those referring to Manchester. Let me say at once that I do not prescribe for heaven-born geniuses who never shoot twice, but bring down their quarry at the first shot, if we may take them at their word. Further, I hold no brief for any man, but give my actual personal experience for the benefit of my fellow-members. I am not one of those engineers who seem to occupy a greater part of their time in sending circular letters to their *confrères*, asking for particulars on every conceivable subject under the sun connected with gas-works management. I have never made a practice of this, and I do not intend to commence it now. Hence my decision, when writing the paper, not to ask for any particulars whatever from others as to their experiences with inclined retorts as against horizontal retorts and machinery. After hearing the earlier speakers in the discussion, I am more than ever convinced that if I had sought this information there would have been great difficulty in getting reliable particulars and unbiassed opinions on the subject; and the paper I submitted would have been less valuable to those interested in this question of inclined *v.* horizontal retorts with machinery than it otherwise is. I may say that I have always been somewhat prejudiced against inclined retorts, and so am as anxious as anybody to get at the bottom of the respective merits of these as against horizontal retorts with machinery, because I shall be called upon very shortly to design works of a capacity of 10 to 12 million cubic feet per diem; and

my object in reading the paper was to have the whole question thoroughly ventilated. I am rather sorry that there have not been more speakers. I was hoping that we should have a much better discussion at this meeting. It started so well at the last that I am rather disappointed. But I must confess I have not been helped in the slightest degree by the discussion that has taken place, because the zeal of some of the speakers to adversely criticize my paper has run away with their discretion in some of the statements they have made. Some of these statements are not supported by actual facts. Taking carbonizing costs, they have condemned Manchester as paying more wages and giving less work to the men engaged in the machine-worked retort-houses than they should do. But in spite of this admitted excessive generosity on the part of the Manchester Gas Committee, I find that, on referring to the last issue of "Field's Analysis," Manchester's costs for carbonizing wages, including the conveyance of coal to the retorts and coke to the yard, are 2·34d. per 1000 cubic feet sold; there being only five places out of thirty-five with a less cost, and Sheffield is not one of the number—viz., Brentford, 2·13d.; Bromley, 2·16d.; Bath, 2·16d.; Plymouth, 2·29d.; Crystal Palace (South Suburban), 2·29d. I find further that, comparing the figures which are now being published from time to time in the "Gas World," for the year ending December, 1903, or March, 1904, as the case may be, of 72 undertakings, the figure for carbonizing wages for Manchester is 2·22d. per 1000 cubic feet of gas sold; and that out of the whole of these 72 undertakings there are only seven lower—viz., Halifax, 1·96d.; Leigh, 1·97d.; Harrow, 1·98d.; Bath, 2·11d.; Bromley, 2·12d.; Chester, 2·12d.; Bury, 2·13d. The first two of the undertakings that I have mentioned have inclined retorts. So that I am rather surprised to hear that Mr. Wilkinson, when he can get such a figure as that, which is absolutely the lowest, should talk about giving up inclined retorts and adhering to horizontals. Mr. Duxbury made the statement that he knew of places where the work was being done at practically 100 per cent. less per ton of coal than was the case in Manchester; but he has since corrected that.

Mr. DUXBURY: What I meant to say was that Manchester was paying 50 per cent. less than other places.

Mr. NEWBIGGING: I congratulate those engineers whose carbonizing costs them nothing, and am sorry Mr. Duxbury does not come under that category. What he probably meant to say was that he knew of places where the cost was 100 per cent. more, and that his works very nearly approached that difference. Mr. Duxbury's figure is 3·98d. per 1000 cubic feet sold, against 2·22d. at Manchester, or 79·27 per cent. more.

Mr. DUXBURY: There are plenty of explanations of that.

Mr. NEWBIGGING: Our carbonizing costs for the half year ending September, 1904, are 2·07d. per 1000 cubic feet sold, or 1s. 9·66d. per ton of coal carbonized. Some few years ago, a comparison was made for my Committee as to the wages paid to machine carbonizers in Manchester as compared with five other representative towns, and it was found that they performed 13¼ per cent. less work, and were paid 4½ per cent. more wages. I quite admit that we do pay our men more, and give them less work; but still, in spite of this, we get these figures. It must be remembered also that in the figures we have a considerable amount of hand stoking, which will eventually be done away with. It will be under 2d., and something more like Mr. Wilkinson's. During the time which has elapsed since the reading of my paper, I have been able to make a comparison of the results obtained in the working of the inclined retorts at our Gaythorn Station, as compared with the horizontal retorts and machinery at the Bradford Road Station, over the period of six months ending Sept. 30, 1904, as follows (I must say that these are figures which will go to my Committee; they are not romantic, but actual figures which my Committee will have):—

Inclined Retorts, Gaythorn.

Working Results.	Rate.	Values obtained by Distillation of a Ton of Coal.
Coal carbonized, 25,308 tons.		
Yield of gas per ton, 11,455 c. ft. Illuminating power (unenriched) 14 candles	at 2s. 6d. per 1000 c. ft.	£1 8 7
Coke sold per ton of coal carbonized, 11·08 cwt., at	10s. per ton	0 5 6
Tar made, 12·30 gallons, at	20s. per ton	0 1 3
Ammoniacal liquor (10 oz.), 26·40 gallons, at	50s. per 1000 gallons	0 1 4
	Total	£1 16 8

Horizontal Retorts and Stoking Machinery, Bradford Road.

Coal carbonized, 52,370 tons.		
Yield of gas per ton, 11,093 c. ft. Illuminating power (unenriched), 14·5 candles	at 2s. 6d. per 1000 c. ft., reduced to 14-c.p. gas	£1 8 8
Coke sold per ton of coal carbonized, 9·83 cwt., at	10s. per ton	0 4 11
Tar made, 11·10 gallons, at	20s. per ton	0 1 1
Ammoniacal liquor (10 oz.), 31·59 gallons, at	50s. per 1000 gallons	0 1 7
	Total	£1 16 3

In both cases, the retorts at the end of the period in question had been working for over 800 days. I will now deal with the point raised by Mr. Morrison. He said that he got a life of 2000 or 3000 days out of his retorts. I presume he is referring to brick-built retorts?

Mr. MORRISON: Yes.

Mr. NEWBIGGING: We do not use brick-built retorts. The section of the horizontal retorts is 24 in. by 16 in., and that of the inclined retorts 22 in. to 24 in. by 15½ in. The duration of the charges in both cases is six hours—I have put both on the same charge so that the comparison should be fairer—and the weight carbonized per charge is 7½ cwt. in the horizontal retorts, and 7 cwt. in the inclined retorts. This increased value of 5d. per ton of coal carbonized, on a consumption of 50,000 tons per annum, represents a saving of over £1000. This is in addition to the saving in wages already given in my paper, with inclined retorts. Mr. Belton endeavoured to make a good deal of capital out of his large sale of coke per ton carbonized. But I should like to point out that whether this is high or low depends mainly on two things—the amount of ash and moisture in the coke; and it must not be assumed, because one works sells (say) 9 cwt. of coke per ton of coal carbonized and another 11 cwt., that this fact alone shows better carbonizing. I have made some experiments with regard to moisture in coke, which show how very materially it affects the sale of coke per ton. A sample of good grey coke picked up in the yard, just delivered from the retort-house, contained 0·271 per cent. of water. A piece of the same coke soaked in water 24 hours and taken out and allowed to stand outside to drain for another 24 hours, contained 17·6 per cent. of water. Another piece of coke exposed to the rain for two days contained 6·3 per cent. of water. In Manchester, we use a considerable percentage of cheap hard cannel, the coke from which contains as much as 20 to 30 per cent.—and even up to 40 per cent.—of ash; and as we sell our coke as quickly as we make it (rarely holding a week's make in stock), we do not gain a great deal from any quantity of moisture that may be found in it. We never hold more than three or four days' stock. If purchasers insisted on a certain limit of moisture in the coke they bought, there would be a good deal of levelling down in the figures published by gas undertakings as regards the coke sold per ton of coal carbonized. Mr. Belton had pointed out that the yield of gas per ton of coal carbonized in Manchester for the year ended March 31, 1903, was 10,778 cubic feet; but I should like to say that the reason for this is that one of our works is in process of reconstruction, and consequently cannot give the best results during that time. We also have a 3 million cubic feet per day retort-house at Gaythorn, containing ordinary direct-fired retorts, which only gave about 10,000 cubic feet per ton of coal carbonized (sometimes we did not get that out of it); and thus the average make was reduced. This 3 million feet house is being replaced with inclined retorts. He also stated that he did not know what we sold per ton of coal carbonized. This is strange, as it is just as easy to find the quantity sold as that made; but possibly the reason was because, according to the latest figures, we sell 10,389 cubic feet of gas per ton of coal carbonized, against 10,167 cubic feet at Chester. I have no doubt whatever that when our reconstruction work is finished it will approach 11,000 cubic feet sold per ton of coal carbonized. The figure I gave of 2½d. per ton of coal carbonized as the cost of maintaining and working stoking machinery driven by compressed air, has been questioned. In reply, I can only say that this is the figure it works out to in Manchester; and if any Engineer is thinking of adopting stoking machinery, and estimates a lower figure than that, he will find out his mistake. I should like to hear what Mr. Morrison has to say about this figure, because he has had a very large experience in stoking machinery. The corresponding figure for hydraulic stoking machinery is considerably higher than 2½d. per ton of coal carbonized. I will not give it, because I might be attacked if I did so; but I have the figure exactly. The above figure includes wages of mechanics and labourers, oil, tallow, waste, air-tubing, rake-heads, rake-rods, charging-scoops, water, steam, and firemen, and renewal of parts of machinery, &c. When the machines were installed at our Bradford Road station, they were maintained free for a period of six months. During the second year, a sum equal to 4 per cent. on the cost was paid to the contractors; and during the third year this was increased to 5 per cent., because the contractors stated that 4 per cent. on the cost was not sufficient. On the quantity of coal dealt with by the machines—they did not deal with the whole of the house at the time, I should say in fairness to the machines—this worked out to 1¾d. per ton of coal carbonized, exclusive of steam, lubrication, &c.; so that the figure of 2½d. per ton of coal carbonized at the end of ten years' working is a very reasonable one, and speaks volumes for the excellence of the machines. This 2½d. on the cost of all their machinery in the retort-house did not amount to 10 per cent. or 12 per cent. After the machines had been working year in and year out with each retort-house for 24 hours, 2½d. per ton carbonized was a very reasonable figure, and it spoke well for them. I have recently had to investigate the working of projectors; and I have no hesitation in saying that they do not compare at all favourably with the scoop machinery, and in my opinion will never supplant them. Mr. Duxbury states that his cost of maintenance for a period of eighteen months has not been more than £50; but I presume that for some portion of this period his machinery has been worked by the contractors. It must have at least cost the amount named by him for lubrication alone. My friend Mr. Carr has shown his wisdom in sticking to his hand stoking at Widnes, where, although a moderately-sized works, it

is one that would not greatly benefit by the introduction of machinery. His good judgment in this as in other matters has no doubt placed him in the proud position of purveyor of the cheapest gas in the world. In the case of such large undertakings as the one I have charge of, hand stoking is impracticable. So I have to look out for the next best system; and if I find it possible to obtain a successful one that entails the use of a minimum of machinery, that is the one I shall adopt. I am not putting this forward as finality. The figure I gave in my paper of £122 per mouthpiece, as the total cost of the installation of inclined retorts now being erected at our Gaythorn station, was to some extent estimated, as the whole of the contracts were not let at the time. Since then they have been given out, and the exact figure is £118 per mouthpiece. This is against Mr. Duxbury's cost of £110 for a horizontal house; but it must be remembered that my figure includes a very costly river covering, and deducting the extra cost of this, as compared with ordinary foundations, would bring the figure down to £108 per mouthpiece. The cost of the retort-bench, including bracing, ironwork, fittings, chimneys, stage floors, and foul mains, works out to £72 per mouthpiece. It is obvious that the cost of the brickwork alone of the inclined retort-bench is greater than that of a horizontal bench. The bracing of an inclined retort-bench has also to be made of a greater strength than that of a horizontal bench; but taking into account the fact that in the latter there are duplicate ascension-pipes, hydraulic mains, coal-hoppers, elevators, &c., the cost of the ironwork comes out to about the same in both cases. The stage-floors for an inclined retort installation need not be so strong as for a horizontal bench which has to carry machinery; so that there is a saving there. But, taking it on the whole, the ironwork of the one and the other come out about equal. I have gone into it very carefully, and that is the result. The cost of stoking machinery for a retort-house of 2 million cubic feet capacity per diem, including housing for compressing-engines and boiler power, works out to £14 per mouthpiece; and this sum fully covers the extra cost of the brickwork on an inclined bench. You will find, from the figures I have given in my paper, that £14 will very fully cover the extra cost of brickwork. I have recently had some connection with a moderate-sized works, where an alternative tender was given for an installation of inclined retorts, and horizontal retorts and stoking machinery; and the figures are as follows: For the inclined retorts: Ten beds of eight retorts, in vertical tiers, with tile regenerator, including all ironwork, floors, hoppers, charging-shoots, and foul main on top of bench only, coal-conveyor and stallage, cased-in elevator and driving gear, coal-breaker, gearing, and gas-engine (foundations not included), £10,950. For the horizontal retorts: Ten beds of eight retorts in vertical tiers, with tile regenerator, including all ironwork, floors, hoppers, charging-shoots, and foul mains on top of bench only, coal-conveyors and stallage, cased-in elevators and driving gear, coal-breakers, gearing, gas-engine, and hydraulic stoking machinery (foundations not included), £10,980. I maintain that if an equal quality of material and an equally good job is made of the one installation as of the other, the costs are equal. With regard to the respective ground space required for inclines as against horizontal installations, our No. 1 House at Gaythorn is 200 feet long by 51 feet wide. You will find there is plenty of room to work in that space; but, of course, you could have it wider. Horizontals with power machinery would require at least 62 feet by 200 feet. The difference in area is consequently over 21 per cent. in favour of inclines. I gave 20 per cent.; and Mr. Belton, I think, mentioned 14. But if he works it out, he will find it comes to 20 per cent. In conclusion, these are the results of my experiences; and it cannot be gainsaid that they are favourable to inclined retorts, and that the subject has been treated in an impartial manner. I have already mentioned that I am sorry that Mr. Wilkinson is giving up his inclined retorts. Mr. Morrison has spoken about the creeping of coal in these retorts. We use Yorkshire and Lancashire coal, and do not have any trouble with it at all. I did say in my paper that there was creeping, and it is as well to select the coal; but I do not think I have exaggerated the trouble. We have no creeping. We buy Lancashire and Yorkshire coal—about one-third each, and one-third nuts, which works well in the retorts. Mr. Ogden said engineers to corporations could not do as they liked. If they could, I think there would be some very different results in corporation undertakings. Mr. Morrison spoke about the difference in selling price. He represents a Company and we are a Corporation; but where he beats us is in residuals. Our total manufacturing charge is under 7d.; whereas his total charges are 7¾d. Ours are 1½d. higher than normal, because we are reconstructing the Rochester Road works pretty well out of revenue, and are building the Gaythorn works out of revenue; so that my normal figure would be 5½d., against 7¾d. You buy cheaper coal than we do; and you get more for your residuals. My manufacturing charges will be a great deal lower than this shortly. Mr. Hutchinson asked me whether I should still adhere to inclined retorts. I have told you that I am experimenting; but certainly these projectors have not struck me at all. In fact, there are some small works that have adopted them which are getting much better results with their hand labour; and the best thing they could do was to discard them. It did not compare at all with scoop charging, so far as I have seen. Mr. Hawkins asked about the double ascension pipe. I use a pretty large ascension pipe, about 7½ inches in diameter. I have never found any advantage in having a double ascension pipe, though there may be; but, of course, it would make the cost greater, and it would not compare favourably with horizontal retorts.

Mr. HAWKINS: The cost is about £100 for a bed of eight.

Mr. NEWBIGGING: Then, in that case, they would be more expensive than horizontals.

Mr. HAWKINS: But you get better results from them.

Mr. NEWBIGGING: Do you get 11,950 cubic feet per ton of coal carbonized?

Mr. HAWKINS: I do not get the same coal as you use.

Mr. NEWBIGGING: But you can get it.

Mr. HAWKINS: We do not buy screened coal.

Mr. NEWBIGGING: There is a difference of opinion as to whether you should use through-and-through or screened coal. We use a large proportion of nuts; we do not use any unscreened coal at any rate. I think I have now dealt with all the remarks that have been made; and I am only sorry that there has not been a longer discussion at the present meeting.

Mr. HAWKINS: You also use a larger percentage of cannel.

Mr. NEWBIGGING: No; not very much. We use hard cannel, because we get it as cheap as coal. The cannel does not help our yield at all. I should improve my yield if I could get off the cannel. For some few days when we looked specially after the coal supply, we obtained 11,950 cubic feet per ton at Gaythorn, with inclined retorts, and we could have easily reached 12,000 feet; and this was without a dry main.

ADJOURNED DISCUSSION ON MR. KENDRICK'S PAPER, "NOTES ON CARBURETTED WATER GAS WORKINGS."

Mr. H. KENDRICK (Stretford) said he would not reopen the discussion on his paper; but he wished to make one or two amendments in the figures which he had placed before them. The figures which he was about to give would, he thought, bear out the deductions which he had already drawn when he presented the paper to the Association six months ago. First of all, he might state that the coal and residuals market had undergone a change in the last six months. This change had been for the worse so far as the cost of manufacturing coal gas was concerned, and had been rather for the better so far as manufacturing water gas was concerned. In charging the coke to the water-gas plant, the practice was not to take a fixed price all the year round, of what they were selling the coke at in the yard. But they took an average of the yard price week by week; so that if the price of coke was down, the water gas got the benefit of it, whereas if the price went up, it did not. During the last few months, and since the contracts had been entered into for both coal and residuals, he found that the cost of coal gas had gone up at Stretford from 11·8d. to 12·5d., or very nearly ¾d. per 1000 cubic feet. In the corresponding period, the cost of carburetted water gas of the same illuminating power as that given in the paper had gone down just under ¼d.; so that the comparison to-day was 1d. per 1000 cubic feet in favour of water gas as compared with six months ago, taking the same qualities. Referring to the remarks of the two representatives of the Westinghouse Company who attended their tea at the end of the meeting in February last, as to the comparative heating value of the two gases, it would be recollected that they said that it was 16·18 candles per 642 B.T.U. required with coal gas of 18 candles, and just over 17 candles of mixed gas was required to produce the same heating effect in a gas-engine; so that for driving purposes the mixed gas was considerably worse than was the coal gas of equal illuminating power. This, of course, on the face of it, seemed rather a blow for those who sold a mixed gas. He (Mr. Kendrick) had taken out the works cost of the gas on the six months returns which he presented to his Directors for the period they used the carburetted water-gas plant at Stretford, when coal was practically the same price as it was to-day. This was in the year 1899. That was the first year of the rise, when coal went up about 1s. 6d. per ton. The following year it went up 5s. more, and now they had got practically to the period when it was 1s. 6d. higher than the minimum. Then they used a mixture of coal and cannel containing something like 40 per cent., or nearly all seconds cannel, which cost 12s. 10d. per ton; and the works cost, less residuals, was 13·2d. into the holders. Their price to-day, with coal and slack, of coal gas and carburetted water gas at 9s. 2d. per ton, showed a works cost, less residuals, of 10·3d., or 3d. per ton in favour of the mixed gas. This did away with the idea that they were robbing the consumer by sending out mixed gas; for whereas the works cost was 3d. less, the actual sale price to the consumer was 4¼d. less. In 1899, the price was 2s. 10d. per 1000 cubic feet, and to-day the average was 2s. 4¼d. So that, although there was a difference in the works price five years ago of 3d., the price to the consumer was 4½d. per 1000 cubic feet less. These few figures, he thought, would amply bear out the optimistic view he had presented to the Association six months ago.

Mr. J. H. BREARLEY (Longwood) said there were one or two points in connection with the paper that he should like to say a word upon. Mr. Kendrick, in giving the cost of his carburetted water-gas plant, took the cost of a million cubic feet per day at £21,000 odd, and then to compare that he took the cost of half-a-million feet of coal-gas plant. If they doubled the figure for the coal-gas plant, the result would be that the total cost would be £34,708 per million cubic feet of gas. He thought they would all characterize this as a very extravagant figure. For instance, it contained a retort-house at £18,932; yet Mr. Kendrick had just

informed him that he had put up a million cubic feet retort-house coal-gas plant for £13,000. It was all very well to say that was what it cost at Stretford; but what they were getting in the paper was a comparison between the cost of water gas and coal gas, and they ought to have fair figures and not Stretford figures. Mr. Kendrick's figure for his half-a-million feet of coal-gas plant was perhaps what it cost when the price was higher. His carburetted water-gas plant figure was an up-to-date one. Mr. Newbigging, in his paper—which was an excellent contribution to their transactions—gave the cost of the new Rochdale Road retort-house, including the foundations, river covering, building, roof, retort-bench, iron-work, and chimneys complete, and including the plant for dealing with coke, at £118, although from the situation the work had been obviously and unavoidably costly. At 7000 cubic feet per mouthpiece per day, which was a low estimate, it would require 140 mouthpieces to produce a million cubic feet per day; and taking Mr. Newbigging's estimate, this would cost £16,520, against £18,932, which Mr. Kendrick's would cost. So that, putting a most expensive piece of engineering against Mr. Kendrick's figure, they obtained a lower price by £2412. Then, again, who would dream of spending £2050 for the scrubbing plant, or £7624 for the purifying house and plant, or £1476 for meter and meter-house, of a million cubic feet works? The whole basis of comparison on capital charges was unfair to coal gas. There were many contractors, he had no doubt, who would guarantee a thoroughly up-to-date plant right up to the holders capable of producing a million cubic feet for less than £28,000. If they adopted the Masonic rule of halving that, they would get £14,000 for a million cubic feet plant, against £17,352, This would affect the other figures in the paper; it would reduce the interest on capital from 2·776d. to 2·110d. It would bring down the wages cost in manufacturing. An up-to-date coal plant would not, even at Stretford, where presumably good wages were paid, cause gas making to cost 3·426d. per 1000, or (say) 2s. 10¼d. per ton of coal carbonized, in wages. This figure would be fully 1d. less per 1000 cubic feet. The paper went on to work out the comparison on the per-1000-candle basis, when all the time they were being told again and again that the calorimeter was going to be the instrument by which the manufacture of gas should be adjusted. Yet the only information they obtained on this point was, to quote from the paper, "We can safely work up to about 35 per cent. without unduly affecting either the size of the flame or the calorific power, or interfering with the explosive point." He thought the comparison should have been carried from candle to heat units. There was a great point which makers of carburetted water gas who were going into commercial section matters wished a few more members had referred to. As they all knew, since Mr. Kendrick read his paper the price of coke had depreciated considerably; and he thought that one of the greatest, if not the greatest, point in favour of the carburetted water-gas plant was that it took an enormous proportion of the coke off the market, and thereby tended to keep up the price. This had not been put into the paper in £ *s. d.* It had been difficult to arrive at; but he thought the £ *s. d.* from that point of view would be greatly in favour of carburetted water gas, and would help to counterbalance some of the figures to which he had taken exception. Yet, if Mr. Kendrick did not take credit for this, he did hope to give the coal-gas plant a fair chance and take up a million cubic feet carburetted water-gas plant, and compare it with a half-million feet coal-gas plant.

Mr. NEWBIGGING said, as an Engineer who was very greatly interested in the manufacture of water gas (and what they would have done without it during the last few days he did not know), it might be useful to hear from him something about the cost in Manchester. For the year ending March last, their net cost per 1000 cubic feet of water gas, reduced to a 20-candle basis, was 10·61d. The lowest net cost of coal gas at any of the stations, reduced to the 20-candle basis, was 1s. 2·57d. The result of a mixture of these two gases—20-candle gas again—was 1s. 0·34d.

Mr. S. R. OGDEN (Blackburn) said he had been manufacturing carburetted water gas for some nine years, and, taking the cost of from 21 to 22 candle gas over a twelvemonth, the average price ran about 1s. 1½d. It must be understood that the price of coke for the time being militated against the manufacturing charges. He thought he might take it that since they started making carburetted water gas their charge for coke had been on the ascendant. Perhaps this year it had struck the lowest point. The plant they put in occupied a space on which, in the ordinary course, they manufactured coal gas, firing 400,000 cubic feet a day. The plant was a duplicate plant, capable of producing 1½ million feet a day. Not only this, but it was capable of purifying, &c., with the exhauster all on the same plant. The cost was £15,000 without the relief holder, which was not, in the case of gas plant, a very great price. Mr. Kendrick's figure for water-gas plant was a little above what it should be. He could certainly say that the advantage to the Blackburn Corporation from the installation of carburetted water gas had been very extensive—so extensive that he was not prepared to say at the moment how far it had gone; but it had certainly been a distinct advantage to them.

The PRESIDENT said he was afraid that the number of users of water-gas plant was too limited to cause a good discussion. Mr. Brearley had mentioned the point that in a falling market for coke the value of the composition of water gas was very greatly enhanced. Through the arsenic scare, they had apparently lost for ever the market for coke for malting purposes.

A MEMBER remarked that they were getting it back again.

The PRESIDENT said he hoped so; but there did not seem to be much chance of it in his district. At any rate, the more water-gas plants put up, the better would be the return from the coke. Unfortunately, he had had no personal experience in the manufacture of water gas; therefore he could not add to the discussion, but would call on Mr. Kendrick to reply.

Mr. KENDRICK said there was only Mr. Brearley to reply to. Taking his last point first, he rather gathered that he should be tackled with his question, and therefore he came prepared for it. On the present cost of the two gases at Stretford, 17½-candle coal gas gave 660 B.T.U. gross, which worked out at 13·2d. per 1000 to 20d. per 1000 B.T.U. The mixed gas of 17·4-candle power was 564 B.T.U., and at 10·32d. per 1000 it worked out to 18·1d. per 1000 B.T.U., or a difference in favour of the mixed gas of 1·9 per 1000 B.T.U. This was on the gross; he had not worked it out on the net. He thought this answered Mr. Brearley's question as to how it worked out on the calorimeter. Therefore he claimed that, both on the calorimeter test and on the candle power, the mixed gas would be cheaper to their consumers than if he supplied coal gas of 17½-candle power alone. As far as the wages for carbonizing were concerned, the members must understand that the Stretford Gas-Works were very old. They were in course of reconstruction, and would probably be so for five or six years; so that, like Mr. Newbigging, he was not altogether responsible for the carbonizing wages. He certainly had a machine house, but he also had a hand-stoking house; and, as both his own wishes and his Board's instructions were to work the hand-stoking house for all it was worth, and get rid of it, it naturally enhanced the cost of wages for gas making. When he had the machine house on alone, the wages per 1000 cubic feet, instead of being 3·45d., were slightly under 2½d., which he thought, for manual charging, was fairly reasonable when all the circumstances had been taken into account. So far as the cost of the plant was concerned, perhaps he had overstated the cost of the coal-gas plant; but he was obliged to understate the cost of the water-gas plant as well. For instance, he divided the total sum by two, whereas the building in which the water-gas plant was housed would hold three sets of plant. It was estimated that the oil-tanks were sufficient for storing oil for three sets of plant, or 1½ millions. It was the same with regard to the relief holders. To avoid complication, he did not mention this in his paper, but simply divided the sum by two. There were certainly deductions that might be made from the retort-house and the purifying-house; but, for the sake of simplicity, he did not want to enter into abstruse calculations for the water-gas plant. For the same reason, he did not make any abstruse calculations for the coal-gas plant. The figures given were the actual ones taken from his books; but, as he had said, he might perhaps have made deductions from them, if he had thought it advisable. He had explained the reason why he did not do so. He had no doubt some of his neighbours had built gas-works at considerably less cost than they did at Stretford; but there were exceptional circumstances in their case. They happened to be about a mile from the railway station, and on the banks of a canal. Most of the contractors insisted on sending their goods by rail; and the Company, of course, had to pay for it. The only other point he desired to emphasize was this—that there were many gas-works which charged an all-the-year-round sum, whatever the price for their coke was, and did not vary it when this went up or down. At Stretford they always charged the yard price, whatever the top one was, and not the contract price. This gave a fair comparison year by year; but it would not be a fair one as between Stretford and neighbouring works where they always charged the lowest figure. He was much obliged for the attention given to his paper, and, like Mr. Newbigging, was only sorry it had not elicited more discussion.

Mr. W. EVERITT (Ilkley) then read the following paper on

THE EXTRACTION OF TAR FOG FROM CRUDE COAL GAS.

In again bringing before your notice the question of tar fog, I take it to be not out of place to here give a very brief description of our existing apparatus, which was proved inadequate to clear the suspended matter out of the crude gas prior to its entry to the dry purifiers. Such apparatus consists of—

I.—A 14-inch diameter foul main with a condensing surface of 940 square feet. Average temperature of the crude gas entering condensers, 85° Fahr.

II.—Atmospheric condensers (under control in sections). Four sets of 5 inches diameter cast-iron pipes. Total condensing surface 552 square feet. Sufficient to reduce the maximum make to atmospheric temperature. Combined condensing surface, 4·2 square feet per 1000 cubic feet maximum make.

III.—Two tower scrubbers, each 7 feet diameter by 25 feet high, filled with rough-sawn thin boards, placed about ⅜ inch apart. Down the first, ammoniacal liquor is pumped and distributed at the rate of 4 tons per hour. Clean water is distributed over the boards of the second one at the rate of 10 gallons per ton of coal carbonized.

Annual make	74,000,000 cubic feet
Maximum daily make	350,000 ,,
Minimum ,, ,, ...	100,000 ,,

The condensing surface performs a dual duty: First by reduction of the temperature of the crude product, moisture and oily

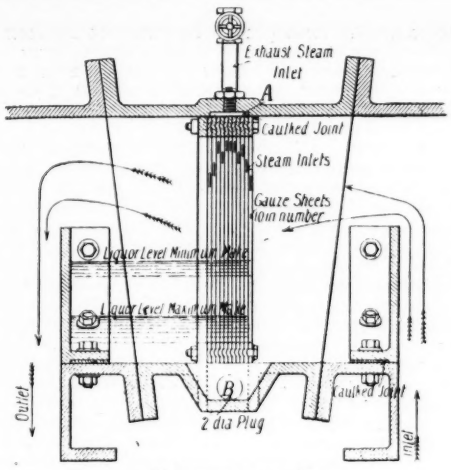


FIG. 1.—LONGITUDINAL SECTION.

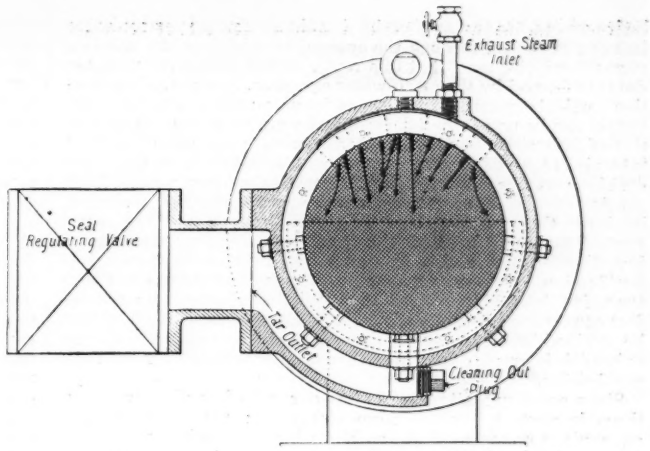


FIG. 2.—END SECTION.

vapours that cannot be carried to the point of consumption are partially precipitated. Secondly, by friction, the suspended or floating tarry matter is partly brought down. But the latter duty, so inefficiently performed, has, in my own case, necessitated the search for other methods much more efficient, and much less expensive, than elaborate additions to a condensing plant already sufficient for the purpose of reducing the temperature to 60° Fahr. before entering the scrubbers. Further, such apparatus is altogether out of proportion in cost and attention to the work to be accomplished, which literally consists of the abstraction of 2 gallons of tar per ton of coal carbonized.

Work on the lines of the previous experiment has been the means of evolving the apparatus described below. This I have found effective, not only in the elimination of the tar, but in the reduction of gaseous impurities, and in bringing the crude product to a state which makes subsequent purification comparatively easy. The crude gas, prior to its entry to the condensers, is filtered through a series of screens of iron wire gauze (20 meshes per inch). They are fixed vertically, about $\frac{1}{4}$ inch apart, by means of metal separating rings at their circumferences; and in between each screen and its neighbour a portion of the exhaust steam from the pump or exhauster is injected (intermittently, of course), through long and narrow slits in the separating rings. Hence it will be seen that the steam currents, carrying droplets of water, are regularly and frequently exerting a force always at right angles to the natural direction of the gas current.

Fig. 1 is a section of the apparatus, showing the screens fixed vertically in a horizontal iron vessel. A is an extended steam inlet, communicating with the whole of the steam-ports between the screens. B is the tar outlet, connected to a seal valve, which can be utilized to increase or decrease the area of the screens, and so work the apparatus with a minimum of back-pressure, which need not exceed $1\frac{1}{2}$ inches. Fig. 2 shows the steam-ports arranged at different angles with the vertical, so as to sweep in the various spaces the whole of the area of the screens, and set up wild confusion of the threads of gas travelling to the outlet.

The precipitation of all tarry matter is due to the following causes: Collision between droplets of condensed water and tarry particles, with the consequent alteration of their form from globular to that of flattened ellipses, and in some instances breaking up the vesicles, liberating their contained gases, and forming larger combined particles of a sufficient size to cling to the screens placed in their paths on the way to the outlet.

The steam currents carry portions of gas down the faces of the screens; thus scrubbing it in its forcible downward movement and precipitating the tar on these faces, only to be immediately removed to the bottom of the vessel by subsequent steam currents, whence it is withdrawn by sealed pipes. The momentary cessation of the steam currents, when the piston of the exhauster engine has nearly reached the end of its stroke, allows the gas current to regain its position, only to be immediately deflected downwards. Thus an oscillation up and down the screens is constantly taking place, with the consequent abstraction of tar by violent friction. The quantity of steam injected per ton of coal carbonized is equivalent to 12 gallons of water, all of which is converted into ammoniacal liquor. Seven gallons appear at the outlet of the apparatus as the result of direct condensation; the other 5 gallons are brought down in the atmospheric condensers. The tar precipitated within the apparatus is equivalent to 2 gallons per ton of coal used.

AVERAGE ANALYSES OF THE PRECIPITATED TAR AND CONDENSED AMMONIACAL LIQUORS.

The following method, culled from a paper read by Mr. A. W. Cooke before the Society of Chemical Industry (*vide* the Society's "Journal," No. 3, Vol. XX.*), was the one adopted for the estimation of sulphuretted hydrogen—viz., 25 cc. of the sample diluted with water to 150 cc. is distilled, in apparatus similar to that used for the estimation of ammonia, into 700 cc. of water containing sufficient caustic soda to combine with all the carbonic acid and sulphuretted hydrogen contained in the liquor, the solution is cooled, slightly acidified with acetic acid, and titrated with decinormal iodine.

* See "JOURNAL" for April 23, 1901, p. 1067.

Tar (B).

Ammoniacal liquor and loss	4 per cent.
First runnings and light oils	18 ,,
Creosote oil	25 ,,
Anthracene oil	11 ,,
Pitch	42 ,,

Ammoniacal Liquor (C).

Precipitated between the screens, 7 gallons per ton of coal used.

NH_3	= 1·14 p. ct.	= 798 grs. per gal.	× 7 =	55 grs. per 100 c. ft. of gas	
CO_2	= 0·40 ,,	= 280 ,, ,,	× 7 =	19 ,, ,,	,,
H_2S	= 0·32 ,,	= 224 ,, ,,	× 7 =	15 ,, ,,	,,

Ammoniacal Liquor (D).

Condensed in atmospheric condenser, 5 gallons per ton of coal used.

NH_3	= 1·35 p. ct.	= 945 grs. per gal.	× 5 =	47 grs. per 100 c. ft. of gas	
CO_2	= 0·50 ,,	= 350 ,, ,,	× 5 =	17 ,, ,,	,,
H_2S	= 0·71 ,,	= 500 ,, ,,	× 5 =	25 ,, ,,	,,

The analysis of the precipitated tar shows the percentage of pitch to be very low, and the light oils of low-boiling points very high; and from observation of the active solvent action of gas treated in the manner described, upon tarry matter previously adhering to the inner surfaces of condensing pipes and tower scrubbers, I assume that the crude gas, coming into very intimate contact with steam-heated tar containing comparatively large quantities of benzol, and in such fine division, exerts its carrying power to the utmost. Yet any volatile oils or vapours not so firmly held, or for which the crude gas had not so much affinity, or for which the thin tar had more affinity than the crude gas, are precipitated. Benzene forms a prominent feature in gas so treated, while oils of higher boiling points are to a very great extent removed from further contact. This drastic treatment, while causing no diminution of the illuminating power, appears to offer a solution of the naphthalene difficulty; for any loosely held vapour, hesitating to be carried forward, will either be absorbed by the hot thin tar or carried over with an excess of benzene. The probability is that the naphthalene is deposited; for one sample of tar gave a creosote oil, the whole of which fraction was solid at 20° C.

Statement Showing the Impurities Removed up to the Point of Dry Purification.

[The figures in cols. 2 to 6 represent grains per 100 cubic feet.]

Impurities per 100 Cubic Feet of Gas.	In Hydraulic and Foul Mains.*	By Steam Condensed between the Screens.	By Condensation of Further Portion of Steam.	By Liquor Scrubber.	By Clean Water Scrubber.†	Passing Forward to Dry Purifiers.
(1)	(2)	(3)	(4)	(5)	(6)	(7)
NH_3 449 grs.	136	55	49	165	44	Traces
CO_2 1100 ,,	47	19	17	216	28	773
H_2S 720 ,,	28	15	25	53	37	562

* Tar removed per ton of coal used, 12 gallons—*i.e.*, 10 gallons in the hydraulic and foul mains, and 2 gallons by steam condensed between the screens.

† Ten gallons of water were distributed per ton of coal used; and the resultant gas liquor showed—

NH_3	0·58 per cent.
CO_2	0·37 ,,
H_2S	0·49 ,,

The ammoniacal liquor directly precipitated within the space of 4 cubic feet occupied by the vessel containing the screens, averages 5·2 oz. strength, and the quantity 7 gallons per ton of coal used. This represents 55 grains of ammonia, 15 grains of sulphuretted

hydrogen, and 19 grains of carbonic acid abstracted per 100 cubic feet of gas passed through the apparatus; and from the table on p. 701 it will be seen that this result closely compares with the duty performed by the clean-water scrubber, though their respective cubical spaces are in the ratio of 1 : 237. Time contact appears to be non-essential for the absorption of certain quantities of impurities in very crude gas, when such gas is brought into violent and intimate contact with absorbents in fine subdivision; for the gas is hurried through the screens, passing from the first to the last of the series in about one-ninth of a second, having in this short period of time been deprived of at least 4 per cent. of its impurity. This theory of violent contact is worthy of investigation with a view of arriving at a successful method of purification in closed vessels; and I maintain that the first step towards this end is the absolute abstraction of all tarry matter—first converting the crude product into an invisible gas. This can be attained by the apparatus described when regulated to absorb only slightly greater pressures than that mentioned for ordinary purification.

Since no tarry matter now enters our set of condenser pipes, there is perfect freedom from stoppages; the whole of the ammonia is recovered (the crude gas having absolute and therefore greater freedom to come into close contact with the wetted surfaces in the scrubbers, than was the case when tarry particles intervened); the liquor is kept at a strength of 10 oz.; and the oxide purifiers are now run for longer periods, with no indication of rising back-pressure.

Discussion.

The PRESIDENT said they had had a very useful paper from Mr. Everitt; and he hoped it would lead to an interesting discussion.

Mr. J. W. MORRISON (Sheffield) said Mr. Everitt seemed to think that this might probably be a solution of the naphthalene difficulty. As this was a matter of interest to him, he should like to ask Mr. Everitt if he had had any experience of the difficulty of naphthalene in the apparatus he had described, and whether he had noticed any benefit since he had adopted the apparatus.

Mr. J. WILKINSON (Halifax) said, with reference to the yield of ammoniacal liquor per ton of coal carbonized—judging from the excessive amount of clean water inserted into Mr. Everitt's plant (22 gallons per ton of coal), and seeing that he was able to maintain his liquor at this strength—it struck him that there must have been 40 per cent. of carbonic acid per ton of coal carbonized. If this were so, there must be more purification taking place than was indicated in the table. According to the table, there was only 3¼ per cent. of carbonic acid, and 5½ per cent. of sulphuretted hydrogen. It must be either that, or else his coal must have more ammonia in it, to enable him to keep up the 10-oz. liquor, and so enable him to use 22 gallons of water per ton of coal carbonized.

Mr. H. KENDRICK (Stretford) said it appeared to him that, if the plant described became really useful, they would have to go back to the days of hot scrubbing. The Ilkley plant appeared to be a mixture of a Pelouze and Audouin condenser with a scrubber, because the only purpose of the steam being emitted seemed to be to wash the tar off the screens that were there, and not to assist in the purification, although this took place by reason of the presence of a large amount of moisture. He should like to ask Mr. Everitt if he took any steps to ensure that the spaces in his screens should be as blind as possible to one another—that the gas should not have a clear way through. The meshes were rather fine; still, if they were open right through, it seemed to him that less tar would be deposited there than would be the case with a Pelouze and Audouin condenser. The results which Mr. Everitt appeared to have secured were very good; but so far as the naphthalene difficulty was concerned, he did not think they would go very far. Out of one sample he thought he said he got a fraction which was isolated, so that it did not seem to have been a regular thing. If he was wrong in what he supposed from Mr. Everitt's paper, it would certainly be a help to some of their friends who were troubled with the naphthalene difficulty. Fortunately, he was one of those who were not, although he had been at works where it was a great difficulty.

Mr. J. H. BUCKLEY (Formby) asked if Mr. Everitt had found any difference in the pressure on the retort side of the screens compared with the exhauster side, and also whether the special casting was of a larger area than the 14-inch foul main.

Mr. J. H. BREARLEY (Longwood) said about twelve months ago he had the pleasure of seeing the apparatus which Mr. Everitt had then at work; but he emitted the steam at that time by an old Anderson exhauster. He was afraid that this would militate against the adoption in works generally of anything like the plant described because the cost of the motive power would prevent engineers from trying it. It did seem to him that there was here a great field for research. He did not like to suggest that Mr. Everitt should read them a third paper on the subject; but it did seem to him, with respect to the naphthalene question, that more light might be thrown upon it. They had no tests showing the effect with respect to naphthalene in the gas with the apparatus and without it. The apparatus would undoubtedly help them to get better tests for naphthalene. At the present time there was no satisfactory method of analyzing the crude gas for naphthalene when it contained the tarry globules; but, after it had passed through the condensers, a fairly accurate analysis could be carried out. This apparatus accomplished one thing—it gave them power to analyze for naphthalene in the gas fairly accurately. He should like to have some further particulars, if Mr. Everitt could give them, as to the analysis of the finished gas with and without the apparatus working. There were some deductions with respect to benzene and with respect to the solvency exercised by benzene on the naphthalene or *vice versâ*—that was to say, whether the benzene was maintained in suspension or taken out by solvent action. Mr. Everitt could find this out if he took tests of his gas with and without the apparatus working. He could take tests for the amount of benzene contained in it, and the amount of naphthalene. He would suggest at the same time that Mr. Everitt should put the figures before them either in a paper or by means of a contribution to the Technical Press.

Mr. J. C. BELTON (Chester) said the author was to be complimented on his ingenuity. Mr. Everitt said that the apparatus could be worked with a minimum of back-pressure, which need not exceed 1½ inches. But did he mean back-pressure on the retort side of the apparatus. If so, how did he work the exhauster—with a vacuum or not?

Mr. C. ELLIOTT (Leyland) said his practical experience with regard to the introduction of steam between the foul main and the scrubber was that it caused a deposition of naphthalene rather than took it away.

The PRESIDENT was sure they would all admire the little piece of apparatus exhibited. He was about to ask the same question as Mr. Belton had raised; and that was how Mr. Everitt got over the 1½ inches of back-pressure. With regard to the naphthalene question, he had a Pelouze and Audouin tar extractor in operation at Wakefield; and he was a very great believer in taking out what Mr. Everitt described as tar fog. He thought that Mr. Everitt, in addition to giving them the apparatus shown, had also enriched their language with that expression. At a meeting of the Institution of Gas Engineers in London, he (the President) had stated that at Wakefield they had been free from naphthalene since he had adopted Mr. Morrison's plan of keeping the temperature at the outlet of the condenser up to 80° or 100°. But about the middle of August, he had been much upset and astounded at receiving a very considerable number of complaints of naphthalene after he thought it had been completely cured, and had stated so publicly. On looking into the matter, he found that they had a certain amount of tar in their scrubbers, which was due to a little accident with their liquor pot. He steamed the scrubbers, and got the tar out; and since that time he had not had a complaint. He had come to the conclusion that, in order to avoid naphthalene, one wanted to take all the tar out while it was hot, and did not want to have the slightest particle of tar in any part of the apparatus where it would get cold. He believed that this had had a great deal to do with the deposition of naphthalene in his district. Before they had the Pelouze and Audouin tar extractor in operation, and working with the temperature of the gas at the outlet of the condenser at 60°, their district was flooded with naphthalene, and the works too. Then when they put in the Pelouze and Audouin tar extractor and the condenser, working it at a high temperature (and he was working it now at anything between 80° and 100°), the Pelouze and Audouin tar extractor took out every particle of tar and tar fog. Then, by keeping the other apparatus—the screens particularly—absolutely free from tar, no matter what the temperature was, whether it was freezing or the sun was playing on it, and it was up to 80° or 90°, they had absolutely no deposit of naphthalene in the district. In closing, he would only repeat that he had come to the conclusion that the presence of tar in the screens was a great source of naphthalene in the district, either at high or low temperatures.

Mr. EVERITT, in reply to Mr. Morrison, said he had never been troubled with naphthalene in any form in his district; but the test of a small stream taken from the outlet of the apparatus gave a large quantity of red-coloured oil, which boiled at a temperature of 87° C, with the thermometer in the liquid; and it came over between 82° and 83°—showing that this was practically the whole of the benzene. If there were any naphthalene in the apparatus, then a portion of it would be in the benzene or the red oil; but it was not there. Consequently, the whole of the naphthalene that did pass forward was there knocked down in the wire entanglement; for if anything was loosely held, where so many streams of 3 lbs. pressure were playing on them up against very fine wires, it could not exist there, while a light oil could exist because of the heat. Mr. Wilkinson had referred to the number of gallons of 10-oz. liquor made. He took 38 gallons, and calculated it on this basis. They bought coal that was fairly dry, or did not contain on an average more than 14 gallons to the ton, which, of course, came down on distillation. In fact, one of the coals only contained 9 or 10 gallons; so that the total worked out at 9 gallons of 10-oz. liquor, and the sulphate came out at 27 lbs. per ton of coal. The difference in pressure had been mentioned by Mr. Belton. The apparatus absorbed 1·2 inches of pressure. That was to say, supposing one wanted to keep on the hydraulic main a level gauge, then it would be necessary to work at 1½-inch water vacuum on the outlet of the apparatus. Then a question was asked about the size of the foul main. It was 14 inches. The drawings had been got out to the actual size of the apparatus in use, and the diameter of the screen opened to the gas was only 15 inches, because the 14-inch foul main was a large one for their main. He might add that the screens were kept perfectly taut by the separate rings at the top having a little

fillet fastened on to them. The stream consequently kept them clean. In fact, an apparatus on these lines had been working for about eight weeks; and it had not on any occasion thrown more than 1½ inches of back-pressure.

Votes of Thanks.

Mr. J. H. Brearley (Longwood) proposed a vote of thanks to the readers of the papers, and to the gentlemen who had replied upon the discussion of the two papers that were adjourned from last February. He thought every one of them, whether or not he agreed with the deductions made, must agree that these gentlemen had ably defended the point of view which they took up. Mr. Newbigging, particularly, had given an excellent exposition, from his point of view, on the question involved in his paper. Without detaining the meeting further, he would propose a hearty vote of thanks to Messrs. Newbigging, Kendrick, and Everitt for their contributions to the literature of the Institution.

Mr. W. Prince (Stoke-on-Trent) seconded the resolution. After hearing the papers and the discussions, he was more than ever convinced of the power of figures with careful management. They could certainly be made to prove anything and everything. When he heard the former discussion on these two papers, he thought the authors were going to have a very hot time on the adjourned discussion; but the wonderful way in which they had extricated themselves, and had convinced the members by their figures, went to prove the old adage about statistics.

The resolution was put and carried unanimously.

Mr. Newbigging, on behalf of Mr. Kendrick, Mr. Everitt, and himself, returned thanks for the resolution. He said, so far as he was concerned, he had been amply repaid for any trouble he had taken in the preparation of his paper, by the discussion that it had elicited; and he had no doubt he might say the same for the other two gentlemen. The discussion at the last meeting had started well. But he had been disappointed to find that it had not continued as it had begun; and he had hoped to have more to reply to. However, if he gained any further experiences—as no doubt he would be in a position to do by having one station working with inclined retorts and another with horizontal retort machinery of the same capacity—he would be very pleased to place the figures before the members.

The President was glad to hear that Mr. Newbigging was going to give them another paper. He should have made the suggestion, had not Mr. Newbigging volunteered it, as he would have a unique opportunity of practically deciding the controversy which had been going on in the Technical Press.

Report of the Scrutineers.

The report of the Scrutineers showed that the ballot for the election of office-bearers for the ensuing year had resulted as follows:—

President.—Mr. S. Meunier.
Senior Vice-President.—Mr. J. H. Brearley.
Junior Vice-President.—Mr. W. Prince.
Treasurer.—Mr. Thomas Newbigging.
Secretary.—Mr. H. Kendrick.
Committee.—Messrs. Morrison, Pennington, and Surtees.
Auditors.—Messrs. Lord and Everitt.

The following new members were elected: Messrs. Ryecroft, Sayner, Woodward, Bottomley, and Richmond.

The Secretary, in the absence of the President-Elect, said he hoped that the new President would receive a little better response to the circular that he would send out than had previously been the case. Out of 146 circulars sent out, he had received only 32 promises of attendances and 16 apologies. He would like to ask what Secretary could make adequate arrangements if, with such figures as these, 60 turned up to the meeting. Further, it did not look as if members took a great interest in the election of the officers; for, out of 143 ballot-papers sent out, only 73 had been returned. He was very pleased to find that the election of the President, Vice-President, and himself had been unanimous. He had done his best for the members in the past; and, with their support, he trusted he should be able to do so for the next twelve months.

Notice of Motion.

Mr. Belton gave notice that he would move, at the next meeting, that the excursion meetings be limited to one per annum instead of two as at present. He would give his reasons at the next meeting.

Gas v. Electricity as Motive Power.—Particulars have reached us of some trials of gas and electricity for the production of motive power which have lately been conducted at works in Wolverhampton. The gas-engine was a nominal 12-horse power one, and had been in use for eight years. The electric motor was built specially for the trial. The gas-engine started first, and completed a run of 76½ hours for a total consumption of 23,054 cubic feet of gas, which works out, with gas at 2s. per 1000 cubic feet, to a sum of £2 6s. 1d. The motor was then coupled on to the same shaft, with identically the same load, and ran precisely the same length of time. The amount of current absorbed was 788 units, which, at a price of 1·22d. per unit, works out at £4 0s. 1d.—a difference of £1 14s. in favour of the gas-engine.

THE LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Visit to the Poplar Gas-Works.

The members of this Association inspected the Poplar works of the Commercial Gas Company on Saturday. The party assembled at the works entrance, where they were met by the Engineer (Mr. P. E. Williams), who conducted them over the works. Much interest was shown by the members in all they saw; particular attention being paid to the sulphuric acid plant, where the sulphur from the spent oxide is recovered as sulphuric acid. The sulphate of ammonia plant also claimed its share of attention—more particularly, perhaps, in connection with the excellent quality of the salt produced, of which the Company are justly proud. The party were also interested in the cyanogen extraction plant, owing to the employment of sulphur in crystalline form (which is added to the liquor in a Holmes scrubber), instead of the more usual iron salt. Disappointment was felt by the party at not being able to see the original luteless purifiers constructed by Mr. H. E. Jones; but owing to it becoming prematurely dark, this was not considered advisable.

At the conclusion of the inspection, the President (Mr. Walter Grafton) proposed a vote of thanks to the Company and to Mr. Williams for allowing the members to visit the works, and said he had been interested, and was sure other members were interested, in all they had seen that afternoon. He also wished to thank Mr. Williams for giving up his time for the benefit of the members. Mr. W. E. Dean (Tottenham) seconded the motion. In reply, Mr. Williams said that he was glad to hear the Association had been interested in what they had seen, and was pleased to have met them that afternoon.

JUNIOR INSTITUTION OF ENGINEERS.

Visit to Dudley Port (Mond) and Nechells Gas-Works.

There was a muster of about fifty members of the above-named Institution at Euston Station on Monday last week to take part in the visit which had been arranged to the works of the Mond Gas Company at Dudley Port and also to the Nechells Gas-Works of the Birmingham Corporation, as mentioned in the notice of the proceedings at the opening meeting for the session which has appeared in the "Journal." The party, which was accompanied by Mr. W. H. Lindley, M.Inst. C.E., the new President, Mr. Samuel Cutler, jun. (Chairman), Mr. Adam Hunter (Vice-Chairman), Mr. Walter T. Dunn (Secretary), included several members concerned with gas matters generally. The visit was looked forward to with a great deal of interest, inasmuch as the Institution have the honour of being the first technical body to inspect this important installation for the production of gas for heating and power purposes located at Dudley Port.

The party left Euston at 9.20, and reached Dudley Port about midday. A walk of some five minutes brought the visitors to the works, which they inspected under the able guidance of Mr. H. A. Humphrey, the Consulting Engineer to the South Staffordshire Mond Gas (Power and Heating) Company, which, as our readers will remember, has been established with a capital of a million sterling. The Company have erected their first generating station at Dudley Port, in a position which is practically the industrial centre of the district, comprising 120 square miles in South Staffordshire, over which their parliamentary powers allow them to distribute gas. The first central station has been designed for four units, each of eight producers; and the first unit is now erected, together with a complete set of spare towers. Each producer is capable of gasifying one ton of coal per hour throughout the day and night. The station is well supplied with railway and canal facilities for the cheap handling of the coal, and it is expected to use a common slack of the district, most of which will arrive by canal boats. The coal elevators, storage bunkers, producers, superheaters, gas-mains, mechanical washers, and towers all stand in the open, and can be readily inspected. In the lead acid towers the gas meets a down-flowing stream of acid liquor, which absorbs the ammonia contained, forming sulphate of ammonia, which is afterwards converted into marketable crystals in a separate brick building containing the sulphate plant. The iron towers serve the purpose of cooling the gas and condensing the steam contained in it when it leaves the producers, for heating and saturating the air blast on its way to the producers, and for cooling the water required for the final lowering of the temperature of the gas. The hot water obtained from the towers in which the gas is cooled is made use of in the air tower for heating the blast and saturating the steam. The main building is divided into the boiler-house, the machinery-house, and the pump-house. Steam is raised by means of "Climax" tubular boilers, arranged for burning small coal with forced draught, and also for firing by gas. The two systems can be used simultaneously or separately. In the machinery house are the compressors required to put the gas under a pressure for distribution at 10 lbs. per square inch; also the two vertical Westinghouse gas-engines for supplying power for the various electric motors that are used in connection with the plant, as well as for lighting purposes.

The pump-room contains the necessary pumps for circulating hot and cold water and acid liquor through the various towers; also the blowing sets for supplying air under pressure to the producers, and, lastly, the rotary purifying apparatus for the final treatment of the gas. The floor of the buildings is constructed of concrete and steel, and beneath it is a basement traversed by the various pipes required to connect the different pieces of plant. This arrangement gives a clear floor-space, and obviates the usual unsightly crowding of pipes overhead. The separate buildings are the sulphate plant, meter-testing house, oil-stores, workshop, stores, and offices. The small gasholder upon the site is not connected with any storage of producer gas, but is for the accurate testing of the rotary meters to be used on the distribution system. The pipes for conveying the gas to Wolverhampton, Walsall, and intermediate towns, have been laid. They are mostly of the steel locking-bar (Mephan-Ferguson) type, described in the "JOURNAL" for the 25th ult. (p. 264), and shown at the stand of Stewarts and Lloyds, Limited, in the Entrance Hall at the Earl's Court Exhibition. They are tested to 300 lbs. per square inch before laying. A special form of steel screwed pipe has been adopted for the branch mains.

At the close of the inspection, the visitors partook of luncheon, which had been courteously provided for them, and left Dudley Port shortly after two o'clock for Birmingham—arriving at the Nechells Gas-Works of the Corporation at three. Here they were received by Mr. Henry Hack, the Engineer-in-Chief, divided into parties, and conducted round the establishment—Messrs. Cheney, Murray, and Bowater each taking charge of a party. The inspection of the works—where the visitors were able to witness the complete process of making coal gas, in contradistinction to the operations carried on at Dudley Port—was greatly facilitated by some specially printed descriptive notes, accompanied by a ground plan, which were handed to each member on his arrival. We gave the plan, with some photographs of the works, as a supplement to the "JOURNAL" for Oct. 29, 1901, in conjunction with the report of the proceedings at the meeting of the Midland Association of Gas Managers in Birmingham, when Mr. Hack read a paper describing the plant; and to this our readers may be referred. We, however, give some extracts from the notes.

The inception of the Nechells works practically dates from 1895, when, in order to meet the rapidly increasing demand for gas, it was decided, among other extensions, to erect a larger carburetted water-gas plant on ground which had been acquired by the Gas Committee with the view of ultimately providing room for the extension of the adjacent Saltley works, where the recent deplorable explosion occurred. As the demands of the district still continued to increase at a rapid rate, it was decided in 1897 to erect on the Nechells ground entirely new works capable of producing, in the first section, 5 million cubic feet of coal gas per diem, with provision of plant for a further 5 millions. In order to secure the additional storage capacity required, it was also determined to add two more lifts to a gasholder already existing there, thereby doubling its capacity—*i.e.*, from 2 to 4 million cubic feet—and also erect a new holder of 8¼ million cubic feet capacity.

The storage works, being somewhat more urgent, were commenced first; and of these the following particulars were furnished. In excavating for the gasholder tank, the strata, after the removal of the top soil, were generally sand and ballast mixed, and silty sand; the foundation being on sandstone rock. The depth of this below the coping is 47 feet; the depth of the tank to the top of the landing-stones is 42 feet; and the diameter of the tank is 264 feet. The tank walls and piers are built of hard Staffordshire brown bricks in lias lime mortar, with portland cement bands at intervals. No puddle backing was used; the tank being made water-tight by rendering the internal face of the walls with best portland cement. The bottom, which is cone shaped, is formed of concrete in cement, and rendered like the walls. The gasholder consists of four lifts, of which, as in the case of the enlarged holder adjoining it, the top lift is unsupported by guide-framing. The total weight of the framing is 933 tons, and of the floating portion 1220 tons.

Passing into the manufacturing department, the retort-house is 324 feet long and 114 feet wide, with a semicircular "arch rib" roof of one span. It contains four benches of inclined retorts, each consisting of thirteen settings of eight retorts, heated on the regenerative principle. The whole of the coal and coke is mechanically dealt with. The former falls from hopper waggons into crushers, whence it is elevated and conveyed to eight large storage hoppers placed high up in the retort-house, and capable of holding 40 tons each. From the hoppers it falls into measuring chambers on the charging-machine. The coke falls on to De Brouwer conveyors, which take it out of the retort-house to the skip pit in connection with a hydraulic crane of 75 feet radius, by which it is raised to screens for loading into railway trucks and canal boats or stacked on the ground.

From the retort-house the crude gas is drawn through atmospheric and water condensers by two pairs of rotary exhausters, each capable of passing 300,000 cubic feet of gas per hour. From the exhausters it is forced through a washer, washer-scrubbers, purifiers, and meters (two in number, each capable of passing 250,000 cubic feet of gas per hour) into the holder. Alongside the exhauster-house is the pump-house containing tar and liquor pumps and hydraulic power pumps; and adjoining this house is the boiler-house, equipped with five Lancashire boilers, fitted with forced draught apparatus and economizers.

The purifier-house is 277 ft. 6 in. long and 102 feet wide, with open sides, and is constructed of steel stanchions, carrying an overhead floor and roof which is of a trussed design with flat bars for ties and T struts and rafters. The purifiers are on the ground floor, and consist of twelve boxes, each 40 ft. by 35 ft. and 5 ft. 8 in. deep, with wrought-iron covers and hydraulic seal. Each cover is fitted with a hydraulic ram in the centre, for raising and lowering by hydraulic pressure of 700 lbs. per square inch. The second floor is used for the manipulation of the purifying material, which is raised thereto, as it arrives in railway waggons, by means of a hydraulic waggon lift.

The whole of the manufacturing and purifying plant here outlined, which has been designed and carried out under the supervision of Mr. Hack, is now in course of duplication; and when finished it will complete the scheme of works originally designed—viz., for 10 million cubic feet of gas per diem, excluding water gas. Plant for producing this gas was laid down in part in 1896, and extended in 1897 and 1900; and it is capable of producing upwards of 6 million cubic feet of gas per diem. In connection with it, there are four large oil-storage tanks, constructed of steel, 60 feet in diameter and 25 feet high, having a total capacity of 1,760,000 gallons.

After the inspection, the visitors were invited by Mr. Hack to afternoon tea—his thoughtful consideration for their comfort being highly appreciated. The repast occupied the time till it was necessary for the party to leave in order to catch the seven o'clock train from Birmingham, which reached London shortly before ten. The party dispersed at Euston, after an exceedingly instructive day's excursion, all the arrangements for which were admirably carried out by Mr. Dunn.

"PETROLITE" INCANDESCENT GAS-LAMPS.

Not only did the invention of the incandescent mantle start a new era in gas lighting, and enabled it to hold its own against the electric light, but the universal use of the incandescent mantle and arc lamps created also a demand for lamps of higher illuminating power in places where no gas or electricity was available. Many efforts have been made to apply the principle of incandescent lighting, with more or less (generally less) success, to portable lamps. The new "Petrolite" lamp, it is claimed, has not only solved this great problem in all respects, but has beaten every known record of high illuminating power with such lamps, combined with absolute safety, economy, and simplicity. To this lamp our attention has been called by Mr. Ernest F. Brown, of "Petrolite" Limited, No. 106, York Road, Lambeth—a gentleman who for many years was associated with Messrs. William Sugg and Co., Limited. In the lamp petrol is used; but the great feature is that, instead of the reservoir holding liquid, a stone block of great absorbing power takes up the petrol, and it is drawn from it again by suction when the lamp is in use.

The cost of burning a "Petrolite" lamp, giving 50-candle power, is less than one-quarter that of ordinary paraffin lamps. In addition to cheapness and high efficiency, other noteworthy points are the ease of regulation and length of burning. The lamp is as portable as any mantle lamp can be; it is free from smell or creeping of oil; and, as regards safety, it is extinguished when tipped over, and (as already shown) cannot explode or spill any liquid. Some severe tests by the British Fire Prevention Committee have conclusively proved the safety of the lamps. The lighted lamps were repeatedly overturned, and thrown on a heap of muslin and other highly inflammable articles; but they were simply extinguished, and failure followed every attempt to create a fire or other mishap.

The length of burning depends on the size of the block, and the amount of petrol it absorbs. The blocks are made to burn twelve, fifteen, twenty, or thirty hours, according to requirements, whether for household or out-of-door use. It is important, however, when using one or more lamps, to provide extra containers in the proportion of one to every three in use. This is recommended, so that the block can be given an occasional rest, and become perfectly dry. If this principle is followed, the container, it is stated, will last for years.

We have received from the office of our French contemporary "Le Journal de l'Eclairage au Gaz" a copy of the annual which has for the past few years been issued by the conductors of that publication. It is entitled a "Répertoire de l'Eclairage," and is a general guide to the gas and electric light industries in France. The contents are grouped in four divisions. The first consists of tables of squares, cubes, &c., and other matter useful to the gas or electric lighting engineer; the second contains the names of officials in the service of companies and municipalities; the third gives a list of gas companies, towns lighted, and suppliers of gas appliances; and the fourth, a list of the electric light companies having their offices in France, and the names of the towns lighted and of the suppliers of apparatus. It has been the endeavour of those who are responsible for the production of the annual not only to bring its contents well up to date but to ensure their accuracy. The book is neatly bound; and it should prove a useful work of reference.

AEROGENE GAS.

The "Chemiker Zeitung" gives a digest of a paper recently read by Herr Stern, of Berlin, on "Aerogene Gas," which is a form of air gas that has of late become well known on the Continent. It resembles air gas in general, in being made from air and hydrocarbon such as benzoline; but it is said that its manufacture is so conducted that the resulting gas is always of uniform composition, and not liable to deposit condensation products in the pipes. The apparatus used in its manufacture comprises a simple rotatory pump driven by clockwork or other motor, which draws in air and mixes it intimately with the hydrocarbon. The aspirated air is measured by a gas-meter of usual construction, to the extended axle of the drum of which is attached a scooping apparatus which constantly passes the hydrocarbon into the stream of air. The uniform composition of the gas is thus ensured; and as the whole process is carried on at the ordinary temperature, all risk of condensation taking place is excluded. The gas is used for lighting solely by means of incandescent burners, which afford an illuminating duty of 50 candles (? Hefners) for a consumption of 3·53 cubic feet per hour. The hydrocarbon used is known as "Solin," and is a benzoline of specific gravity ·66—·68. The consumption of hydrocarbon is 15·6 lbs. per 1000 cubic feet of aerogene gas; and the cost of the hydrocarbon (in Germany) is about 2⅛d. per pound, or 1s. 2⅛d. per gallon. Consequently, the cost of material per 1000 candle (? Hefner) hours is about 2·4d. According to Herr Stern, this is considerably cheaper than petroleum or acetylene, the cost of which per 1000 candle-hours is put at 7·2d. There is very little risk of explosion, as the lower explosive limit with air is at 34 per cent., while for coal gas it is at 8 per cent., and for acetylene at 3·5 per cent. Aerogene gas is not poisonous, and is applicable for heating and motor purposes. It thus has a promising future for quite small installations, for which it would not pay to erect coal-gas plant.

PEAT GAS FOR GAS-ENGINES.

The superior inherent economy of the gas-engine over the steam-engine, and the prevalence of peat deposits in the Austro-Hungarian Empire, have naturally turned the attention of Austrian technical men to the possibility of employing gas made from peat as a fuel for gas-motors. So far as the production of gas from peat is concerned, the chief difficulties lie in avoiding the formation of tar and in achieving economical working. According to Herr E. Hubendick, who discussed the matter recently in the Austrian "Metallurgical Journal," if tar is formed, it has to be separated, with consequent loss of heating power and complication of the plant. On the other hand, if gas is made without tar, it is difficult to attain a sufficiently good working duty in the generator. A Deutz plant at Oldenburg has shown a consumption per horse-power-hour of 2·8 lbs. of cut peat containing 16·5 per cent. of water. With a Körting generator for peat fuel, it has been found that the consumption varies per horse-power-hour from 6·2 to 1·65 lbs., according as the calorific power of the peat changes from 2250 to 9000 B.T.U. per pound. The calorific value of moor peat is 7740 B.T.U. per pound, of meadow peat 9000, and of bog peat 8460 in the anhydrous state, or with 25 per cent. of moisture present, 5525, 6480 and 6065 B.T.U. per pound respectively. Average peat of a calorific power of 6300 B.T.U. per pound shows a 50 per cent. greater cost for the development of power when used as solid fuel to generate steam than when gasified for use in the gas-engine. As to whether peat gas can compete with semi-water gas, anthracite, or coke, the author considers this a question of locality. On the Austrian sea board, anthracite is the most suitable fuel; but in the interior peat gas is the cheapest source of power. The cost of installation is about the same for steam or gas power; but the maintenance charges are lower with gas-engines than with steam-engines. Gas which will serve for motor use can be made without difficulty from peat, and the generator may be used when convenient for other fuel.

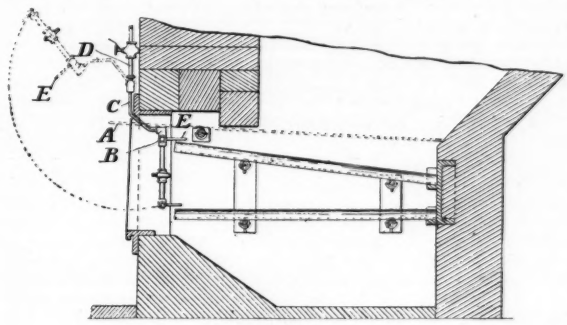
Protecting the Ryde Water Supply.—The Ryde Town Council have resolved to ask the sanction of the Local Government Board to the borrowing of £7400, in order to deal with the newly-acquired land at the Knighton Water-Works. The cost incidental to the arbitration proceedings for obtaining the land was £3985; and it was estimated that £3198 would have to be expended in carrying out the measures contemplated for protecting the water supply.

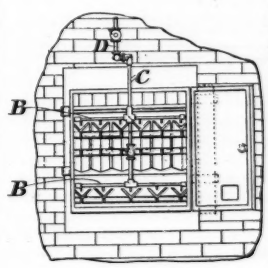
Portsmouth Water-Works Company.—The ordinary half-yearly meeting of this Company was held on Thursday—Mr. W. Grant, J.P., in the chair. In moving the adoption of the report, noticed last week (p. 636), the Chairman stated that since the previous meeting the Directors had been in communication with the Admiralty as to certain things they required which were not mentioned in the agreement for supplying water to the Dockyard. This had led to a supplementary agreement, by which the Company had obtained all they wanted without cost. By the advice of their Consulting Engineers (Messrs. Joseph Quick and Son) they had incurred some extra expense in the course of tunnelling under Hilsea Bridge; but when the work was completed, they would have means for a second source of water to meet the requirements of the town. This placed the supply in a most satisfactory condition, as there would be no possibility of any interruption.

REGISTER OF PATENTS.

Furnaces of Gas-Producers.—Bell, J. F., of Derby, and Masters, R. of Dudley. No. 28,342; Dec. 24, 1903.

One part of this invention relates to an arrangement for feeding water on to the furnace bars of retort-furnaces, so as to obtain a uniform





drip along all the bars and enable the water drip-pipes to be readily swung out of the way of the furnace men when clinkering. Again, in order to generate more steam to pass up through the furnace-bars, the patentees propose to provide underneath the latter a set of angle-section or other trough-section water bars or pipes extending from the front to the back of the furnace, into which water drips or flows so as to form steam underneath the fire-bars of the furnace, to pass up between the bars and through the fire and further assist in keeping the fire-bars cool and free from clinkers.

A sectional side elevation is shown of a gas-producer furnace with the invention applied; also a front elevation of the furnace with one half of the door removed and the other half open.

The fire-bars of the producer on which the fire rests are inclined as usual from the front of the furnace towards the back, and they are (by preference) of angle section resting on cross bearers, made with grooves to receive the bars. One of the spear bars used to carry the fire while the fire-bars are being withdrawn is marked A.

In carrying out the first part of the invention, there is provided within the furnace door frame a horizontal water-supply pipe B, made with small outlet nozzles corresponding with, and immediately over, the angle section fire-bars, down which the water runs. This horizontal pipe B is connected with, and is carried by, an upright pipe C, bent under the top of the door frame. The top of this pipe is connected by a swivel joint to the water-supply pipe D; the joint being so arranged that, when the furnace door is open, the horizontal pipe B, with the upright pipe C, can be swung upwards, as indicated by dotted lines, out of the way of the man who is clinkering. When, however, it is desired, the pipes can be swung down again into position within the furnace door frame, so that the outlet nozzles E will be immediately over the furnace-bars, on to which the water can drip.

When an additional set of water-bars is provided below the fire-bars already referred to (in accordance with the second part of the invention), these additional fire-bars are carried by bearers in the same way as the other fire-bars; and they are arranged horizontally, or nearly so—preferably with their fore ends stopped up, so that the bars form water-troughs and contain water to form steam underneath the upper fire-bars, which is drawn up through the fire and further assists in keeping the upper fire-bars cool and free from clinkers, and also forms the steam which is necessary in the producer. When these additional bars are provided, the horizonal pipe B has connected to it by a vertical pipe another horizontal pipe of the proper length to enter and clear the door frame, and provided with outlet nozzles corresponding in position with the trough section bars, so that the water can be supplied through these nozzles to the water-bars below the fire-grate.

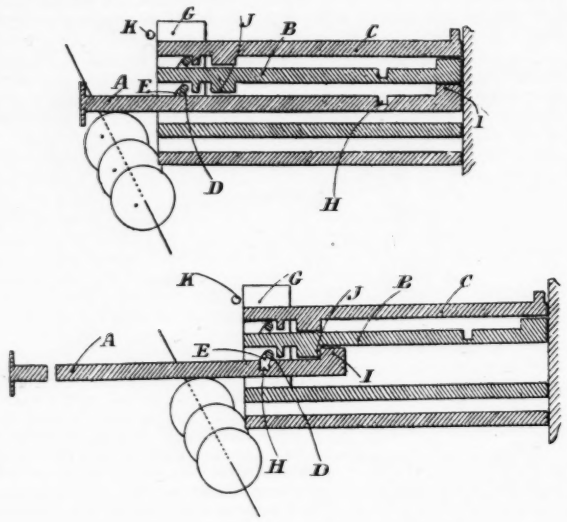
Discharging Retorts.—Howarth, F. W.; a communication from the Compagnie Parisienne d'Eclairage et de Chauffage par le Gaz. No. 532; Jan. 8, 1904.

This invention relates to apparatus for discharging retorts of the type described in patent No. 368 of 1902—more particularly the mechanism for actuating and locking two consecutive racks of the apparatus. Pins (or the like) and recesses or apertures are combined with, or provided in, the racks for the purpose of preventing or ensuring respectively the actuation of the racks in their proper order and at the proper times.

The illustrations (p. 706) show three racks in their innermost or "home" positions, and again with the first rack moved out.

Assuming that the three racks A, B, C have all been moved completely home, then, when the apparatus is set in motion for the purpose of commencing the discharging operation, the first or inner rack A, which is alone in engagement with its toothed driving wheel, is set in motion. The second rack B is not driven by friction—it is kept back by a first pin D, which is held at each end in a bearing E formed in the third rack C and resting on the first rack A. This pin extends through an aperture F formed in the second rack B. The third rack is itself kept back in the same manner by a second pin, which is held

at each end in a bearing formed in a guard plate G fixed to the framing. When the first rack is nearing the end of its stroke, a recess H, formed in the upper part of the rack, arrives underneath the first pin D. The latter moves down into this recess, and can then be moved along by, and with, the first rack A by reason of the shape of the bearing E, which comprises a vertical and a horizontal portion connected together by a curved portion.



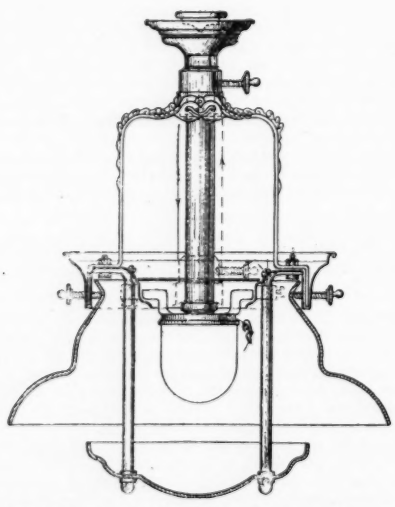
A shoulder I at the rear of the first rack A bears at this moment against a shoulder J formed on the forward portion of the second rack B, and allows this second rack to be moved along by the first rack until the rack B engages its pinion. Almost at the same moment the driving pinion of the first rack ceases to engage that rack. The second rack moves forward and pushes the first rack; the connection between the two being ensured by means of the first pin, which is engaged on one side in the aperture F of the second rack B, and on the other side in the recess H of the first rack A.

During the forward movement of the second rack B, the third rack C is kept in its place. When the second rack is about to arrive at the end of its stroke, the actuation of the third rack C, and its engagement with its driving pinion, are effected in the same manner as in the case of the second rack B. At the end of its stroke, the third rack is kept in place by abutting against a fixed stop K.

For the return stroke the same movements take place in the reverse directions. The pins return readily of themselves into their first positions by reason of the curve that connects the horizontal portion and the vertical portion of their bearings. The pins may be easily inserted and removed from their bearings by means of lateral apertures provided for this purpose in the machine.

Inverted Incandescent Lamp.—Steinicke, T., of Berlin. No. 19,754; Sept. 13, 1904.

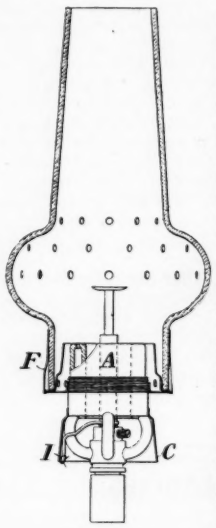
The speciality of this arrangement of lamp is that the burner and mantle are "freely suspended within a shade open at the bottom and at the top," but with a smaller shade arranged immediately below the mantle.



The gas enters through an injector into the central burner-tube, into which atmospheric air is drawn through a feeding device above. From the burner-tube, the mixture of gas and air is blown downwards into the mantle suspended on a socket as usual. The mantle is not enclosed by a chimney or glass of any kind. On the contrary, it is located within an open space into which atmospheric air has ready access both from below and above. To change the mantle without removing the glass shades, it is only necessary to lower the gallery of the lamp to which the outer shade is secured by clamping screws; while the small shade is removeably secured to one or more pins carried by the same gallery, or by suspending arms fixed to the larger gallery. The arms form a yoke having a central tubular aperture, and are secured to a sleeve arranged to slide on the burner-tube.

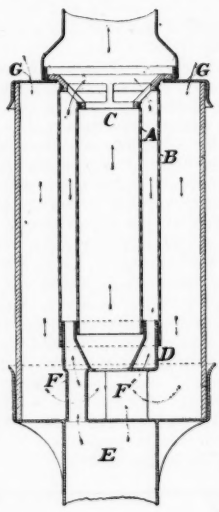
Lighting Burners or Jets.—Dittlo, L., and Magnin, J., of Paris. No. 19,782; Sept. 14, 1904.

This invention relates to a lighting burner or jet with a naked flame, which, when combined with the perforated globe or glass chimney described in patent No. 18,944 of 1902, "gives a powerful light without the use of a mantle or cylinder made of rare earths or clays." A "suitable form" of the burner is shown. It has a crown A; and the consumption of the burner—that is to say, the height of the flame—is regulated by the lever B. On the burner is fitted, "with gentle friction," a bell or receiver C, which is preferably slightly flared or widened out towards the bottom, and adjusted exactly on the periphery of the burner, as shown. The bell is furnished with two little horizontal rods or snugs I, and between them the end of the lever B bears. By turning the bell round with the hand, the lever is actuated in one direction or the other, and the flame regulated. The bell is principally for the purpose of ensuring a considerable draught of air under the burner, which current of air, passing upwards through the centre of the flame, "brings about its perfect distribution and effects a more complete combustion of gas." In addition to this, its use "considerably improves the lighting power of the burner or jet, owing to the fact that the afflux or current of oxygen upon the flame becomes increased, not only by the presence of the bell or receiver C, which forms a funnel or air induction orifice, but also through the perforations in the chimney." The chimney is fitted upon the gallery F, as described in the previous patent.



Incandescent Burners and Mantles.—Clarke, F. H., of Southampton. No. 16,460; July 26, 1904.

This burner is arranged for two mantles A B, of different sizes, but each of equal diameter throughout its entire length, and the apertures top and bottom being of equal size. The mantles are suspended from an arrangement of double rings C, one mantle within the other, leaving a clear space between the two of about $\frac{3}{8}$ inch, more or less. The top of the burner D is in the shape of a ring; the outer mantle enclosing the outside of the burner, and the smaller one fitting inside the top of the burner—leaving a clear circular space through the centre of the upper part of the burner for a central current of air. The lower part of the burner is made in the usual cylindrical form, and acts as a chamber for mixing the gas and air which enter at the base. The upper chamber of the burner is connected with a lower chamber E by means of elliptical vertical tubes F, which serve as passages for the mixture of gas and air from the lower to the upper chamber, the spaces between the tubes acting as passages for admitting the air to the inside of the inner mantle. In this way, a constant current of air, already heated, is supplied to both mantles. The framework which holds the glass chimney excludes the air passing into the burner from the outside. A perforated cap resting on the top of the glass chimney carries a long metal chimney, so arranged as to exclude the air passing direct in from the outside of the outer mantle. The sole inlet for the air is through the perforated cap G, near the top of the flame. It passes down on the outside of the outer mantle, through the openings between the vertical tubes in the body of the burner, up through the inside of the inner mantle, and escapes by the metal chimney.



The patentee claims that the following advantages are brought about by this arrangement: By securing a supply of already heated air coming into the burner from near the top of the flame, and passing this already heated air down on the outside of the outer mantle, and up through the inside of the inner mantle, there are secured "a practically perfect combustion, a more intense incandescence, greater density of light, and increased illuminating power." By the arrangement of the two mantles and the ring-shaped top of the burner, the flame is confined and brought into contact with a much greater area of mantle. Consequently, "a much increased illuminating power will be obtained."

Inclined Gas-Retort Beds.—Little, A. J. S. B., of Smethwick. No. 24,995; Nov. 17, 1903.

This invention consists of a gas-producer together with regenerator passages underneath the upper or charging ends of the inclined gas-

retorts in the space formed by the angle of the bed, so that there is only one stage which is used for the purpose of charging coal to the retorts and also coke to the producer—situated above the producer and at the usual distance below the charging mouths of the retorts. Thus, as the producer and the regenerator passages are arranged in the space formed by the incline of the retorts (instead of being below the lower ends of the retorts as is usual), the total height from the bottom of the gas-producer to the top of the retorts, together with the height of the retort-house, " will be considerably reduced."

Further details of the proposal are unnecessary here, in view of the illustrated article dealing with Mr. Little's proposals appearing in another part (p. 680) of this issue of the " JOURNAL."

Manufacture and Purification of Illuminating Gas.—Colson, A., of Leicester. No. 16,766; July 29, 1904.

The invention relates to the removal of naphthalene from illuminating gas; and the specification of the patent was given (practically speaking) entire in the " JOURNAL " for Oct. 11, p. 97, and so need not be further referred to in these columns.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Carbonizing Coal in Vertical Retorts.

SIR,—In further reference to my letter published in the " JOURNAL " dated the 8th inst., reviewing the results obtained by the Settle-Padfield vertical retort, and also containing a question as to whether these were the best results obtainable from the system of intermittent charging in small doses. Some few months back, I remember seeing in a gas journal an article in which the writer referred to a quotation from a learned professor, who showed how difficult it was for people to think other than in the one groove or channel in which the mind happened to have run most; and if I remember correctly, the writer suggested that people desirous of keeping a lead of the times would have to widen their field of thought and insight in the near future. This article is largely responsible for my intrusion upon your valuable space. It caused me to reflect and examine some bygone thoughts and ideas on this and kindred subjects, with the result that action was prompted. Hence the questions in my previous communication.

As to carbonizing in the vertical retort, pardon my making use of a sentence out of my former letter—*i.e.*, Is it not a little strange that so small a carbonizing area should give such high results. In this area, there is an average space of (say) 18 inches diameter available; and to make my point clear, let us suppose that a 7 lb. charge gives a $\frac{3}{4}$-inch layer of coal over this area at each feed. Now look at the small percentage of this which comes in actual contact with the walls of the retort, which I believe up to the present has been considered the prime factor for successful carbonizing.

It will be quite obvious to all that these layers of coal placed in at short intervals cannot for any length of time be kept at a uniform temperature from the outer contact with the retort walls to the centre of the carbonizing coal, which seems to make it bear relationship, in a small degree, to the heavy charge as depicted in the horizontal retort. This must greatly retard the speed of carbonization, quick as it seems, in this respect. It must also be remembered that each succeeding charge is perforce deposited on the coldest part of this carbonizing area; while there is ample retort wall (carbonizing space) waiting that cannot be utilized.

Let us look from another standpoint and arrange the working a little differently. Instead of allowing this 7 lb. charge to fall upon a space 18 inches diameter, with a supposed wall-contact of 40 square inches for each charge, we by some means spread it over the hot walls of the retort to an extent equal to eight, ten, or twelve times the above-named wall-area. In this case it would amount to a mere sanding; and the charges might be speedier or heavier. Would these conditions be likely to greatly enlarge the high results already obtained and placed on record?

T. REDMAN.

Bradford, Nov. 24, 1904.

Ammonia Stills at the Gas Exhibition.

SIR,—In your remarks on the various exhibits at the Earl's Court Gas Exhibition, there is one referring to Messrs. Biggs, Wall, and Co. I note a special feature is mentioned in respect to trays for ammonia stills—viz., " Serrated trays are used in the still for distilling crude ammoniacal liquor; and these trays present several points of novelty. All the trays are machine-faced, thus ensuring a thoroughly sound joint both for gas and liquor. By increasing their number, the working capacity of the still can be greatly added to, at a merely nominal cost. All joints, too, being machined, the trays can be removed, cleaned, and refixed in a very short time."

This is the kind of tray designed by me over eleven years ago; and many sulphate of ammonia plants, with my type of stills with these loose trays planed top and bottom, so as to form a gas and liquor tight joint by simply resting on each other, and enabling the working capacity of the still to be increased considerably by simply adding trays, have during this time been constructed by my firm.

GEO. PETTIGREW.

Thornaby, Nov. 24, 1904.

A few days ago it was stated at the Tottenham Police Court that during the present year no fewer than 1590 panes of glass in street-lamps in Tottenham had been broken.

PARLIAMENTARY INTELLIGENCE.

NOTICES GIVEN FOR BILLS (SESSION 1905) RELATING TO GAS AND WATER SUPPLY.

Abertillery Urban District Council.—The Abertillery Urban District Council will apply for the abandonment or repeal of certain provisions of the Abertillery Local Board (Gas and Water) Act, 1894, and of the Abertillery Urban District Council Act, 1902, and for authority to relinquish certain powers to construct a reservoir and works granted by the latter Act. The Bill will contain various provisions in regard to the Council's water undertaking.

Accrington District Gas and Water Board.—Application will be made by the Board for an extension of their limits of supply by including the parish and township of Altham, in the county of Lancaster; also for authority to construct additional works, to take lands and waters, and alter their rates and charges. Further money powers will be sought, and provision will be made for the cancellation of the debt due from the water undertaking to the gas undertaking, and for the amendment of section 80 of the Accrington District Gas and Water Board Act, 1894. It is proposed to purchase from the Burnley Rural District Council the plant used for the supply of water in the township of Huncoat.

Andover Lighting and Power.—Application will be made for the dissolution and re-incorporation of the Andover Gas and Coke Company, Limited, and the vesting of the undertaking in the new Company. The existing capital is to be converted, and more will be asked for. Sanction will be sought for the supply of electric energy in Andover, and for the acceptance of transfers of " authorized undertakings "—the powers of the Corporation with regard to electric lighting being specially mentioned.

Aylesbury Gas.—The Aylesbury Gaslight and Coke Company, Limited, will apply to be dissolved and re-incorporated, with power to supply gas in the urban district of Aylesbury and the parish of Aston Clinton and other parishes in Buckinghamshire. The capital is to be defined and increased. The Bill to be promoted will contain provisions to enable the Company to apply for powers under Electric Lighting Acts.

Bangor (County Down) Water and Improvement.—The Urban District Council of Bangor will apply for power to construct additional water-works, comprising a storage reservoir, three filter-basins, &c., and make provision for the prevention of pollution and waste. The Bill will include clauses to sanction the extension of the gas-works, and the enlargement of the limits of gas supply so as to include any part of the rural district of Newtownards within three miles of the boundary of their district; and authority will be sought for the application of the gas profits to the general purposes of the town. More money will be applied for.

Birmingham Corporation.—The Birmingham Corporation will apply (*inter alia*) for authority to reduce the quantity of compensation water to be discharged from the Caban Coch reservoir of their Welsh scheme, and for an amendment of the Act of 1892 in respect of this matter. They will also ask permission, notwithstanding the provisions of that Act, to utilize any compensation water for the purpose of generating power or light, and generally in connection with the works sanctioned by it.

Blackpool Improvement.—In an Improvement Bill to be promoted by the Blackpool Corporation, application will be made for an extension of the period limited for the repayment of the loan sanctioned for the construction by the Fylde Water Board of the reservoir authorized by the Fylde Order of last session.

Bolton Corporation.—Authority will be sought by the Bolton Corporation for the construction of new water-works, comprising two reservoirs and auxiliary works, in Bolton, Turton, and Darwen; and also for a variation of the existing rights as to compensation water.

Bootle Corporation.—In a Bill to sanction the extension of the county borough of Bootle by the inclusion of Orrell, provisions will be included to amend section 5 of the Liverpool Corporation Act of 1890 as to water rates and charges.

Brentwood Gas.—The Brentwood Gas Company will seek to be dissolved and re-incorporated with additional powers and more capital. Authority will be sought to maintain and extend the existing works, purchase lands, supply fittings, &c.

Brockenhurst Gas.—Application will be made for the incorporation of a Company to supply gas to Brockenhurst, Rinefield, and Sway, in the county of Southampton.

Brompton, Chatham, Gillingham, and Rochester Water.—Power will be sought by the Brompton, Chatham, Gillingham, and Rochester Water Company to construct new works, consisting of two wells and pumping-stations, a covered service reservoir, and a conduit or pipe-line. Additional capital and increased borrowing powers will be required.

Budleigh Salterton Urban District Water.—Application will be made by the Budleigh Salterton Urban District Council for power to construct additional works and protect their gathering-ground from pollution. The Bill will contain a number of provisions in regard to the supply of water; among them being authority to exclude water loans from the operation of the Public Health Act, 1875.

Bury Corporation.—In a General Bill to be promoted by the Bury Corporation, application will be made for an extension of the limits of the gas supply, and the amendment or repeal of the Radcliffe and Pilkington Gas Act, 1854, in so far as it relates to the supply of gas by the Company within the borough, the township and parish of Ainsworth, and part of the urban district of Radcliffe.

Colne Corporation.—Application will be made by the Colne Corporation for an extension of the time specified for the completion of the works authorized by the Colne Corporation Act, 1897, and for sanction to the temporary works constructed by the Corporation. The Bill to be promoted will contain provisions in regard to the supply of gas, electricity, and water.

Croydon Corporation.—A General Bill to be promoted by the Croydon Corporation will contain further provisions for the prevention of the pollution of water.

Croydon Gas.—The Croydon Gas Company will apply for sanction to the transfer to them of the undertaking of the Caterham and District Gas Company, and the extension of the limits of supply. The Bill will contain provisions in regard to the capital of the transferred Company, compensation to the officers, the price to be charged for gas, and other incidental matters. Portions of the Redhill Gas Act, 1865, are to be repealed. The number of Directors is to be altered, and provision made for the nomination of a Director of the Caterham Company. It is proposed that the Board shall have power to determine the Secretary's salary.

East Cowes Gas.—Application will be made for the dissolution and re-incorporation of the East Cowes Gas Company, Limited, with authority to supply gas in part of the parish of Whippingham. The limits of supply of the Newport (I.W.) Gas Company are to be altered to allow of this. The capital is to be defined and increased; and the works extended. The usual provisions in regard to the supply of gas will be included in the Bill.

Epping Gas.—The Epping Gas Company, Limited, desire to be dissolved and re-incorporated, with power to supply gas in the parish of Epping, and other parishes in the county of Essex. The capital is to be increased and defined.

Gaslight and Coke, South Metropolitan, and Commercial Gas.—The scope of the Bill of which notice has been given by these Companies was indicated in the "JOURNAL" last week (p. 623).

Great Berkhampstead Gas.—The Great Berkhampstead Gaslight and Coke Company, Limited, desire to be dissolved and re-incorporated; and the Bill to be promoted for the purpose of effecting this object will contain provisions for raising additional capital, extending the works, dealing in stoves, fittings, &c., and other matters incidental to the supply of gas.

Halifax Corporation.—In a General Bill to be promoted by the Halifax Corporation, further powers will be sought in respect of the gas undertaking. They will refer mainly to the use of anti-fluctuators on gas-engines, and to the prescription of the period of error in the case of defective gas-meters.

Heckmondwike Improvement.—In an Improvement Bill to be promoted by the Heckmondwike Urban District Council, they will apply for the amendment of the provisions of the Dewsbury and Heckmondwike Water-Works Act, 1876, and all other Acts relating to the Dewsbury and Heckmondwike Water-Works Board, the Heckmondwike Electric Lighting Order, 1891, and all other Acts or Orders relating to the Council.

Hessle Gas.—The Hessle Gas Company desire to be dissolved and re-incorporated with extended powers as to gas as well as with authority to make application for permission to employ their funds in the supply of electricity. The area is defined as the urban district of Hessle, and the parishes of Anlaby, Willerby, and Kirk Ella. The capital is to be regulated, and more will be asked for.

Hessle Urban District Council.—An Improvement Bill to be promoted by the Hessle Urban District Council will contain provisions for the purchase and transfer to them of the undertaking of the Hessle Gaslight and Coke Company, Limited. The usual powers granted to suppliers of gas will be sought. In the event of the transfer taking place, the Company will, of course, be wound up.

Higham and Hundred of Hoo Water.—Power will be sought by the Higham and Hundred of Hoo Water Company to raise additional capital and increase their borrowing powers and the number of the Directors. The Bill will contain provisions for the detection and prevention of waste, the supply of water to premises used partly for trade or manufacturing purposes, the laying of pipes in private streets, &c.

Hitchin and District Gas.—The Hitchin and District Gas Company, Limited, will apply to be dissolved and re-incorporated, with additional capital and borrowing powers. The Bill will contain the usual provisions in regard to the supply of gas in bulk as well as under ordinary conditions, the levying of rates and charges, &c.; and power will be sought to maintain and extend the present works.

Hythe Corporation.—The Corporation of Hythe intend to apply for power to construct water-works, make provisions for securing the purity of water, lay an electric main outside the borough and supply electricity for water-works purposes, and raise more money.

Llandrindod Wells Urban District Council.—In a General Bill of which the Council give notice, authority will be sought for the construction of additional water-works, consisting of an intake and settling-tank in the River Chwefri, and a conduit or pipe-line. The waters of the river named and those of the Ithon are to be taken. Additional borrowing powers will be applied for.

London County Council (General Powers).—In a General Bill to be promoted by the London County Council, authority will be sought for the supply of electric fittings by the Metropolitan Borough Councils; and the Council will apply for an extension or definition of the provisions of section 48 of the Public Health (London) Act, 1891, so as to prescribe what shall be deemed to be, for the purposes of the section, "a sufficient supply of water for an occupied house."

London Gas.—The London County Council have given notice of their intention to promote a Bill to make further provisions with respect to the testing of the gas supplied by the three Metropolitan Companies. The full text of the notice will be found on p. 710.

Loughborough Corporation.—Application will be made for an extension of the time specified for the completion of certain works authorized by the Loughborough Corporation Act, 1897, and the formation of the sinking fund. Powers will be sought to refuse to supply gas and electricity to persons in certain cases.

Mansfield Corporation.—Authority will be sought by the Mansfield Corporation for the construction of new water-works, and the confirmation of an agreement with the Duke of Portland for the sale and purchase of land for water-works purposes. The Corporation will also apply for sanction to the application of the profits arising from the gas and water undertakings to the erection of a museum and the alteration or construction of municipal buildings.

Matlock Bath Improvement.—The Matlock Bath Urban District Council intend to promote an Improvement Bill in which provision will be made for the purchase of certain lands and the construction of gas-works thereon.

Morley Corporation.—In a General Bill to be promoted by the Morley Corporation, authority will be sought for the construction of conduits and other water-works, the supply of water in bulk, and the making of agreements with the Corporation of Halifax and the Audsley East and West Urban District Council in regard to the supply of water.

North Sussex Gas.—Application will be made for the incorporation of a Company to construct and maintain gas-works, and to supply gas in Billingshurst, Slinfold, and other parishes in Sussex. Powers will be sought with regard to the supply of electricity.

Nottingham Corporation.—The Corporation of Nottingham have given notice of a General Bill in which further powers will be sought with reference to their gas, water, and electricity undertakings. They wish to be authorized to construct a covered service reservoir in the parish of Arnold, and abandon one sanctioned by their Act of 1897, as well as a portion of an aqueduct; to decline to supply gas or electricity to any person who is in arrear for either form of light or power; and to make bye-laws as to internal gas pipes and fittings.

Otley Gas and Improvement.—The Urban District Council of Otley will apply for power to purchase, by compulsion or agreement, the undertaking of the Otley Gas Company, maintain and improve the works, and supply gas in their district and in the parishes of Newall-with-Clifton, Farnley, and Weston, all in the West Riding of the county of York, or within such other limits as may be prescribed. Additional borrowing powers will be applied for.

Rhondda Urban District Council.—In a General Bill of which the Council have given notice, they will apply for an extension of time for the purchase of lands and the completion of the water-works authorized by the Ystradyfodwg Urban District Council (Gas and Water) Act, 1896, and other Acts; also for authority to erect gas-works on a piece of land now in their possession adjoining the existing works, and purchase and dispose of other lands.

Seaham Gas.—Authority will be sought to dissolve and re-incorporate the Seaham Gas and Lighting Company, Limited, with additional capital and other powers. The existing works are to be maintained and enlarged.

Shepton Mallet Gas (Electric Lighting).—Power will be sought by the Shepton Mallet Gas Company to purchase, produce, supply, and store electricity, and erect works for the purpose within their gas limits. Additional capital will be needed.

Skegness Water.—Authority will be sought for the incorporation of a Company for the supply of water at and near Skegness. It is proposed to acquire the existing works of the Earl of Scarborough, and make additions thereto. The limits of supply are the parish and urban district of Skegness, the parish of Winthorpe, and a portion of the parish of Croft. The usual powers granted to water companies will be applied for.

South Metropolitan Gas.—The principal features in the notice for this Bill were indicated last week (p. 623).

South Oxfordshire Water and Gas.—Application will he made by the Thames Valley and Goring Water and Gas Company, Limited, to be dissolved and re-incorporated; the undertaking to be vested in the new Company. Power will be sought to extend the present area of supply, and to purchase by agreement the water undertaking of any person, company, or local authority supplying water within the limits defined and extended by the intended Act. The capital is to be defined and increased, and provision will be made for keeping the gas and water capitals separate.

Southport, Birkdale, and West Lancashire Water Board.—The Board intend to apply for an extension of their limits of supply so as to include the township and parish of Bickerstaffe, in the rural district of West Lancashire, and for power to construct additional works, and purchase the pipes, &c., of the Earl of Derby in the above-named place. It is proposed to alter the constitution of the Board. Various financial provisions will be included in the Bill—some relating to the borrowing of money.

South Suburban Gas.—The scope of the Bill to be promoted by the South Suburban Gas Company was shown in the abstract of the notice given last week (p. 623).

Stockport Corporation.—Application will be made by the Stockport Corporation for power to appropriate and use the waters of the River Kinder prior to the completion of the reservoir on that river authorized by the Corporation's Act of 1901, and also to construct additional works, consisting of an intake on the right bank of the Kinder and two conduits or pipe-lines.

Sunderland and South Shields Water.—Application will be made by the Sunderland and South Shields Water Company for power to construct additional works in the county of Durham, and extend their limits of supply so as to include Monk Hesleden, Castle Eden, Hutton Henry, and other places in that county. More capital will be required.

Swansea Corporation.—Application will be made by the Swansea Corporation for authority to construct water-works in the counties of Brecknock and Glamorgan. Additional money powers will be sought.

Tees Valley Water Board.—The Board will apply for an extension of time for the completion of certain works, and for an enlargement of the borrowing powers of the Corporations of Middlesbrough, Stockton, and Thornaby-on-Tees. It is proposed to effect several financial changes, and to increase the amount of the reserve fund authorized by the Stockton and Middlesbrough Corporations Water-Works Act, 1876. More money will be required.

Thames Conservancy.—In a Bill of which notice has been given by the Conservators of the River Thames "for the improvement of the river, and for facilitating the traffic thereon," a clause will be inserted to alter the point of measurement of the flow of the river, in connection with the control of the water taken by the Metropolitan Water Board below Penton Hook, and fix it at Molesey Weir, and also to prescribe the quantity which must be allowed to pass that point.

Authority will be sought for the Conservators and the Board to enter into agreements in relation to the supply of water.

Torpoint Water.—Authority will be sought by the Urban District Council of Torpoint to construct additional water-works in the county of Cornwall, and carry out measures for preventing the contamination and discoloration of water. Further borrowing powers will be applied for.

Tralee Urban District Council.—In a Bill to be promoted by the Tralee Urban District Council to authorize an extension of their borrowing powers, authority will be sought for the exemption of money borrowed for gas-works, water-works, and other purposes, from the limitation contained in the Public Health (Ireland) Act, 1878, or any other Act.

Truro Water.—Power will be sought by the Truro Water Company to construct additional works, consisting of a covered service reservoir and a conduit or pipe-line in the parish of St. Clement. Provision will be made in the Bill for the prevention of waste of water, and in regard to the supply of fittings, &c. Further capital will be applied for.

Walker and Wallsend Gas.—The Walker and Wallsend Gas Company will apply for power to construct new or additional works, acquire further lands, and provide workmen's houses.

Western Valleys (Mon.) Water and Gas.—Application will be made by the Western Valleys (Mon.) Water and Gas Company for authority to rearrange, adjust, consolidate, or define the capital created and issued under their Acts of 1891 and 1892, or to create additional capital. They will also seek to repeal or amend certain sections of these Acts providing for separate capital and the keeping of separate accounts of the gas and water undertakings; and they will ask for power to agree with local authorities for the purchase of either of these undertakings.

Whitby Urban District Council.—In an Improvement Bill of which notice has been given by the Whitby Urban District Council, provision will be made for the transfer to the Council of the undertaking of the Whitby Water Company, the maintenance and improvement by them of the existing works, and the supply of water within the limits defined in the Acts relating to the Company. The Bill will contain the usual clauses dealing with meters and fittings, the prevention of waste, the sale of water in bulk, &c.

Wrexham Gas.—The Wrexham Gas Company will apply for authority to extend their limits of supply, convert their existing capital, raise more money, and increase their borrowing powers. Provision will be made for the issue of the new capital to the consumers and employees. The Bill will contain the usual clauses in regard to the supply of fittings, the inspecting and testing of meters, &c.

PROVISIONAL ORDER APPLICATIONS (SESSION 1905).

To the Board of Trade, under the Gas and Water Works Facilities Act, 1870.

Aberystwyth Gas.—The Aberystwyth Gas Company will apply for power to raise additional capital, and make further provisions in regard to the supply and consumption of gas and to matters incidental thereto.

Denbigh Water.—The Denbigh Water Company will ask for authority to raise additional capital, supply water in bulk, and make rules and regulations in regard to fittings and the prevention of undue waste.

Dorking Water.—The Dorking Water Company desire an extension of their limits of supply so as to include Capel and Ockley, in Surrey. They also wish for power to enter into agreements with local authorities and other persons.

Formby Gas.—The Formby Gas Company, Limited, notify their intention of applying for further powers. They wish to raise additional capital, secure the exemption of engines, meters, stoves, and fittings from distress, and supply gas in bulk.

Haslemere Gas.—The Haslemere Gas Company, Limited, will apply for power to maintain and continue their existing works, construct additions thereto, and supply gas in certain parishes in the counties of Surrey, Southampton, and West Sussex. More capital will be required.

Heathfield Water and Gas.—Application will be made by certain private persons for power to supply water and gas within the parishes of Heathfield and Waldron, in Sussex. Authority will be sought for making agreements with the Ticehurst and District Water and Gas Company for obtaining from them a supply of water and gas in bulk, and also for raising the capital necessary for the purposes of the undertaking.

Maidenhead Water.—The Maidenhead Water Company will seek power to extend their limits of supply so as to include Shottesbrook, Waltham St. Lawrence, and part of White Waltham, in Berkshire, and to raise additional capital.

St. Neots Water.—Application will be made by the St. Neots Water Company for an extension of their limits of supply so as to include the parishes of Eaton Socon and Little Barford, in the county of Bedford. Additional capital will be required.

Sandiacre Gas.—Application will be made by T. Hooley, Limited, for authority to construct and maintain gas-works at Sandiacre and Stapleford, and supply gas in the parish of Sandiacre, in Derbyshire. Power will be sought by the Company for the disposal of their undertaking to the Shardlow Rural District Council, or to any company or person.

Stanford-le-Hope Gas.—It is the intention of the Stanford-le-Hope Gas Company to apply for power to construct and maintain gas-works at Horndon-on-the-Hill, and to supply gas in various parishes in Essex, or within such other limits as may be prescribed. Provision will be made as to the capital and borrowing powers of the Company.

Staveley Gas.—The Staveley Gas Company will apply for authority to enlarge their works, define and fix the amount of their capital, and raise more money.

Tavistock Gas.—This is an application by private parties for authority to continue the existing gas-works, erect new ones, and supply gas within the urban district and parish of Tavistock, in the county of Devon.

Wey Valley Water.—Application will be made by the Wey Valley Water Company for an extension of their limits of supply so as to include Puttenham and Wanborough, in Surrey, Fernhurst, Linch, Linchmere, and North Ambersham, in West Sussex, and for an alteration of the limits of the Godalming Corporation in regard to water supply. Additional capital will be required.

To the Local Government Board, under the Public Health Act, 1875 and the Gas and Water Works Facilities Act, 1870.

Withnell Urban District Gas.—Power will be sought by the Withnell Urban District Council to construct works and manufacture and supply gas and residual products and appliances, employing their existing funds for the purpose, and raise more money.

To the Secretary for Scotland, under the Private Legislation Procedure (Scotland) Act, 1899.

Arbroath Water.—Application will be made by the Corporation of Arbroath for power to construct additional water-works, and to abandon some which have been sanctioned. They also wish for authority to acquire certain lands, springs, streams, waters, &c. Further borrowing powers will be applied for.

Dundee Water.—The Dundee Water Commissioners will apply for power to construct a number of additional works, and make provision for preventing the pollution of their water supply. They will also ask for the confirmation of an agreement for the supply of water to the burgh of Carnoustie, and the acquisition of the works by which the town is now served. It is proposed to extend the limits of compulsory supply, and apply to the new area the provisions of existing Acts. More money will be required.

Esk Valley Power Gas.—Application will be made for authority to form a Company, to be known as the Esk Valley Power Gas Company, for the supply of power gas in the county of Mid-Lothian. It is proposed to ask for authority to erect gas-producing stations at Mauricewood, near Penicuik, at Burghlee, near Lasswade, at Whitehill, and at Polton. The area of supply is to be the parishes of Penicuik, Glencorse, Lasswade, and Cockpen. The powers to be applied for include the opening of streets and roads.

Glasgow Corporation.—In a comprehensive Order to be applied for by the Corporation of Glasgow, authority will be sought for raising additional capital for their gas and other undertakings.

Grangemouth Water.—Authority will be sought by the Town Council of Grangemouth for an extension of the boundaries of the burgh, and for the inclusion within the limits of compulsory water supply of the districts proposed to be annexed. Additional water-works are to be constructed, and power will be applied for to alter those already sanctioned. More money will be needed.

LEGAL INTELLIGENCE.

Patent Geysers at the Earl's Court Exhibition.

In the Chancery Division of the High Court of Justice last Friday (before Mr. Justice Warrington), Mr. Rowden, K.C., moved in the action of *Ewart and Son v. Flugge*, for an injunction to restrain the defendant from exhibiting certain geysers and hot-water apparatus at the International Gas Exhibition, Earl's Court; there being, as the plaintiffs alleged, clear infringements of their patents, although these had not yet been established in any action. Mr. C. C. Scott, for the defendant, said his client was only acting as agent in England for the sale of the geysers in question, and was not in a position to meet the charge, as notice of the motion was only served on him on Wednesday evening, and the affidavits had only just been received. He asked that the motion should stand over, on the defendant giving an undertaking to keep an account, till motion day next week. Mr. Rowden said that the plaintiffs were in this difficulty, that the show would close on the 17th of December, and it was very important that the defendant should be restrained before then. He quite agreed, however, that his learned friend's clients ought to have an opportunity of answering the affidavits; and, on the undertaking offered, he was willing that the motion should stand over until next Friday. The motion was adjourned accordingly.

Theft of Gas at Falmouth.

At the Falmouth Police Court, last Thursday, Joseph Martin, a dock labourer, was charged with fraudulently consuming gas to the value of £1 8s. 4d., the property of the Falmouth Gas Company, between Aug. 9 and Nov. 16. Mr. J. W. Buckley, the Company's Manager, said a prepayment meter had been fixed in defendant's house, and on the 9th of August it was working correctly. On that date there ought to have been £1 1s. 8d. in it; but the collector only found 2s. 2d. On the 26th of October there ought to have been 2s. 3d., but there was only 4d. The meter was then taken to the gas-works, to be tested, and found correct. Defendant's wife said she knew nothing about the matter. On the 15th inst. they discovered unmistakable evidence that the meter had been tampered with, for in the box they found 11d. instead of 7s. 11d. It was evident that defendant had unscrewed the top of the meter and manipulated the wheels. When spoken to, he owned to it. Mr. Buckley said the Company had 500 of these meters in the town, and a considerable number of people had been fraudulently

getting gas. The Company were reluctant to bring this case forward, but they did it as a warning to others. Evidence was given to the effect that defendant, when charged, said it was done because of his poverty. He was fined 5s. and 9s. costs, or seven days' imprisonment. A second charge of tampering with the meter was withdrawn.

Alleged Infringement of the "A.V.I L." Company's Patent.

At the Manchester Assizes last Friday, Mr. Justice Walton sat to dispose of a case in which the Anti-Vibration Incandescent Lighting Company sought an injunction to restrain the defendant, Mr. B. Crossley, of Burnley, from infringing their patent relating to improvements in burners for incandescent gas lighting. Damages were also claimed. Mr. A. F. Walter and Mr. Cunliffe appeared for the plaintiffs; Dr. Atkinson represented the defendant. Mr. Walter said that the patent alleged to have been infringed was that of Mr. F. E. Nichol, obtained in 1894. He invented and patented an appliance for overcoming all vibration, both vertical and lateral, with incandescent burners; and by its use one mantle had the length of life of five employed without it. The commercial value of the appliance was apparent. In 1902, after the defendant had put his contrivance on the market, the plaintiffs' sales dropped from 67,000 to 41,000, and in 1903 to 36,000. About that time the defendant published a statement to the effect that 55,000 of his anti-vibratory appliances were fitted in one year. His device consisted in suspension by a flexible spring and the use of india-rubber tubing—a distinct infringement, Counsel submitted, of the plaintiffs' patent. Mr. James Swinburne was called to speak as to the merits of the invention. He gave details regarding the construction of the rival appliances, and pointed out their essential identity in principle—the defendant's being, in his opinion, distinctly an infringement of the Nichol patent. A considerable body of evidence was adduced in support of the plaintiffs' case. Dr. Atkinson, for the defence, called witnesses to prove the common use many years ago of lamps (both oil and gas) suspended on springs for the prevention of vibration, especially in mills. The conveyance of gas through a flexible tube to the burner, in the case of portable standards, was well known many years before the date of the patent in question. Addressing his Lordship, Dr. Atkinson contended that there was no ingenuity in the method of applying an old contrivance to incandescent lighting. After a long argument, his Lordship said it was an important point, and he must take time to consider it and consult the authorities cited. He would give judgment either at Liverpool or on his return to London.

A Bankrupt Tar Distiller.

On Monday last week, Mr. G. Leresche, sitting as Deputy Judge, had before him, at the Manchester County Court, Mr. Hamor Lockwood, who carried on business in Manchester as a tar distiller, asphalter, contractor, &c., and who applied for his discharge from bankruptcy. The Official Receiver, in his report, said that the statement of affairs showed liabilities estimated at £660; but the proofs actually admitted amounted to £1275—the discrepancy being due apparently to over-estimates by the bankrupt of the value of certain plots of land, and buildings thereon, which he had mortgaged, to secure the repayment of a sum of £5000 and interest, under which mortgage a sum of £3632, was owing at the date of the receiving order. There were no assets other than those assigned to creditors partly secured, and no dividend had been, or would be, paid to unsecured creditors. The bankrupt stated that he had carried on business in Manchester from 1862 to 1901, when, being short of capital, he sold the concern to a limited liability Company, which had been registered a few days previously as "Hamor Lockwood, Limited," for £73,266. The Company went into liquidation a year after its incorporation. The bankrupt attributed his insolvency to want of capital, to the failure of Hamor Lockwood, Limited, to discharge the debts for which he was liable before the formation of the Company, and also their failure to discharge the bank overdraft, the payment of which he had guaranteed. The Official Receiver reported, as an offence under the Bankruptcy Act, that the assets were not of a value equal to 10s. in the pound on the amount of unsecured liabilities. The Deputy-Judge remarked that he could not say, having heard the circumstances, that the bankrupt was not to blame for the fact that his assets were of a less value than 10s. in the pound. On the other hand, he was entitled to a certain amount of sympathy, because no doubt his property had greatly depreciated. He did not think it was a very bad case. The discharge would be granted, subject to suspense for two years.

Illegal Use of Water at Bristol.

At the Bristol Police Court, on Monday last week, Sidney Hollier Wakley, a plumber, of the Triangle, Bristol, was summoned by the Bristol Water Company for having, on or about the 14th of May, he being the occupier of premises supplied with water by them, fixed pipes to communicate with the service-pipe. Defendant pleaded guilty. Mr. Gerrish, who prosecuted, said that on the 24th of October two inspectors in the employ of the Company visited defendant's premises, and found three offices supplied with water of which no notice had been given. The usual charge would have been £1 10s. per annum. Defendant wrote to the Company expressing regret that he had failed to report the connection, owing to pressure of business, and asking that he might be charged for the supply. He had previously done things which were contrary to the regulations, but no proceedings had been taken. The Company looked on the case as being a very bad one, and asked that a heavy penalty might be inflicted. The maximum was £5. Defendant said the previous matters mentioned were entirely the result of an oversight, which he much regretted. He was sorry he had offended on this occasion and asked for leniency. The Chairman said the Magistrates regarded the case as a very bad one; but as defendant had not been convicted before, they would not inflict the maximum penalty. He would be fined £3 and costs.

MISCELLANEOUS NEWS.

LONDON COUNTY COUNCIL AND THE GAS QUESTION.

A Bill to be Promoted.

At the Meeting of the London County Council to-day, the Parliamentary Committee will present the following report on the subject of the supply of gas in the Metropolis, and the suggested action of the Council next session in regard thereto.

In accordance with the instructions of the Council of Oct. 11, we have prepared the London Gas Bill, and copies of the Bill have been circulated to members. Provision has been made therein for the amendment of the law relating to the testing of gas, which generally will give effect to the undermentioned recommendations contained in the report of the Departmental Committee issued in May of this year, and embodies in addition the proposals contained in the Council's Bill of last session, which was withdrawn in view of the appointment of the Departmental Committee. We deal later with recommendation No. 6. The recommendations of the Departmental Committee were as follows—

1.—That the standard burner to be used for testing the illuminating power of all qualities of gas should remain, as at present, the Sugg's "London" (No. 1) argand burner, and that the chimney to be used therewith should be of uniform size—namely, 6 inches long and $1\frac{7}{8}$ inches internal diameter.

2.—That for the purpose of determining the nominal illuminating power of gas of any quality, the gas should be burnt in the standard burner at the rate of 5 cubic feet an hour.

3.—That provision should be made for official testing of illuminating power in a flat-flame burner, of a kind to be prescribed by the Gas Referees, and that the result of such tests be recorded and notified to the various Authorities and Companies concerned and to the Board of Trade.

4.—That official tests of the calorific power of the gas supplied by each Company should also be made, recorded, and notified as above.

5.—That the existing statutory provision which requires the gas to be wholly free from sulphuretted hydrogen (which is, in fact, impracticable) should be modified, and that for the future the test which the gas should be required to pass should not be more severe than that specified in the schedule to the Gas-Works Clauses Act, 1871.

6.—That the obligation placed upon the Companies with regard to the removal of the sulphur impurities (other than sulphuretted hydrogen) should be abolished, but that testing for information only should continue to be made in such manner and to such extent as may be prescribed by the Gas Referees.

7.—That the gas to be tested should be brought direct from the main to the testing-room by a single service-pipe without tap, branch, or connection.

8.—That in case of difference between the Gas Companies and the Gas Referees as to the reasonableness of any requirements of the Referees, the decision of the Chief Gas Examiner should be conclusive.

9.—That, except as may be involved in the foregoing recommendations, the powers and duties of the Gas Referees should remain as at present.

10.—That it should not be obligatory upon the controlling authority to test on Sundays.

11.—That the duties of the Chief Gas Examiner should include the hearing of all applications by the controlling authority for the recovery of forfeitures in respect of illuminating power, purity, or pressure, and the assessment of the forfeitures to be paid by the Company in all cases except those in which he is unable to certify that the default is not substantial, or that it is not due to careless conduct of the works.

We have conferred with the Public Control Committee with reference to recommendation No. 6, and also upon the subject of the introduction of a new sliding-scale arrangement as regards the price of gas in London. After careful consideration of the former question, and having regard to the whole of that recommendation, provision has been made in the Bill whereby the Gas Referees are empowered to take such steps as may be necessary to discover, if possible, a system by which the sulphur compounds in the gas (other than sulphuretted hydrogen) can be removed without creating a nuisance, and for the forfeitures in respect of sulphur impurities being suspended until such time as a new method of testing has been ascertained, and the Board of Trade think fit to make an order reviving the liability to such forfeitures.

We have also, in view of the general suggestion of the Departmental Committee that the present might furnish an appropriate occasion for securing greater incentive to economy, proposed a revision of the standard price to the extent of a reduction of 1d. in the case of each Company, as some set-off, on behalf of consumers, to the advantages which the Companies would secure from the provisions of the Bill which relax restrictions now applying to them.

The Bill will, in the same way as last year's Bill, make matters arising within the City subject to the City Corporation as the controlling authority within the City. The Council and the City Corporation, as the Council are aware, have on previous occasions supported one another in legislation relating to the Gas Companies.

We recommend—"That the London Gas Bill be approved; that the seal of the Council be affixed to a petition for leave to bring in the Bill; and that the Bill and petition be deposited pursuant to the Standing Orders of Parliament, and with such necessary alterations (if any) in the Bill as the Parliamentary Committee may consider desirable."

The Parliamentary Notice for the Bill.

The following is the text of the notice given by the Council for the Bill above referred to. It was published in the "London Gazette" last Tuesday.

1.—To amend or modify the provisions of section 33 of the Gaslight and Coke Company's Act, 1876, of sections 26 and 34 of the South Metropolitan Gas Company's Act, 1876, and sections 5 and 6 of

the South Metropolitan Gas Act, 1900, and of sections 31 and 52 of the Commercial Gas Act, 1875, section 12 of the Commercial Gas Act, 1902, and the provisions of the Commercial Gas Act, 1903, with respect to the illuminating power and purity and the mode of testing gas supplied by the Gaslight and Coke Company, the South Metropolitan Gas Company, and the Commercial Gas Company respectively (which Companies are hereinafter referred to as "the Gas Companies"); and to prescribe the burners to be used for testing the gas supplied by the Gas Companies, and the mode in which the burners for testing the gas are to be used.

2.—To define and, if thought fit, to reduce or alter, or make provision for reducing or altering, the illuminating power or the description or definition of the illuminating power or quality of the gas to be supplied by the Gas Companies or some of them, and to declare how such illuminating power shall be measured or ascertained.

3.—To make further provision and to confer further powers upon the Gas Referees and the Gas Examiners as defined in the Gaslight and Coke and other Gas Companies Acts Amendment Act, 1880 (hereinafter called "the Act of 1880"), and the Acts therein referred to, with respect to the testing of the gas supplied by the Gas Companies respectively, in order to ascertain the calorific power thereof, the presence and extent of sulphur impurities (other than sulphuretted hydrogen) therein, the illuminating power thereof in a flat-flame burner; for prescribing the provisions as to making such testings, and for recording the results of such testings; and to exempt and relieve the Gas Companies from forfeitures under the Acts in respect of the foregoing matters or some of them to such extent and for such period and subject to such conditions (if any) as the Board of Trade may order or determine, and as may be otherwise prescribed or provided for by the intended Act.

4.—To repeal or amend all or some of the provisions contained in the Acts with respect to the testing of gas for the purpose of ascertaining the presence of sulphuretted hydrogen, and to make other provisions with respect to such testing.

5.—To alter or amend the provisions of the Acts with respect to making daily tests under the Acts and to relieve the Council and any other body, being the controlling authority within the meaning of the Act of 1880, from any obligation to make such tests on a Sunday, and to make other provisions with reference thereto.

6.—To make provision with respect to the service or other pipes connecting mains with testing-places, and with respect to the method of fixing such pipes, and prohibiting taps, branches, or connections with such pipes.

7.—To make further provision for securing the due performance by the Gas Companies respectively of their obligations under the Acts with respect to the illuminating power and purity of gas supplied by the Companies respectively; and for enabling the Council and any other body, being the controlling authority within the meaning of the Act of 1880, to enforce against the Companies compliance with the provisions of the Acts and of the intended Act or some of them.

8.—To provide for the better enforcement of the provisions of the Acts and of notifications, prescriptions, and certificates of the Gas Referees with respect to testing-places, materials, and apparatus to be provided by the Gas Companies.

9.—To alter, amend, or repeal all or some of the provisions as to the standard price to be charged for gas supplied by the Gas Companies respectively, as now regulated by the Acts, or any other Acts relating to the Gas Companies respectively, and also with respect to the sliding-scale of dividend and the variation of dividend in accordance with the increase or decrease of price above or below such standard price; and particularly to alter, amend, or repeal section 8 of the Gaslight and Coke Company's Act, 1903, section 5 of the South Metropolitan Gas Act, 1900, and section 12 of the Commercial Gas Act, 1902, and make new provisions with respect to the aforesaid matters.

10.—To repeal or amend section 12 of the Act of 1880, and to make further provision with reference to appeals under the before-mentioned Acts from the decision of a Gas Examiner to the Chief Gas Examiner, as defined in the Acts, and to enable the Chief Gas Examiner to give decisions in certain cases without hearing the parties, or some of them; to declare and define the cases in which the decisions of the Gas Examiner and the Chief Gas Examiner under the Acts and the intended Act shall be final and conclusive; and to make further provision with reference to proof of the Chief Gas Examiner's certificate or report in legal or other proceedings.

11.—To make provision for enabling the Chief Gas Examiner, in lieu of a Petty Sessional Court as provided by the Acts, to determine in certain cases the amount of the forfeiture to be paid by any of the Gas Companies in respect of any default under the Acts, and for the recovery and application of forfeitures the amount of which is so determined.

12.—To repeal or amend section 18 of the Act of 1880, and to make other and further provision with respect to the liability of the Gas Companies to forfeitures under the Acts and as to the evidence of such liability, and as to the mode and time of enforcing and recovering such forfeitures.

13.—To make provision for the settlement of differences arising between any of the Gas Companies and the Gas Referees under the Acts, and, if thought fit, to provide for the determination thereof by the Chief Gas Examiner.

14.—To repeal sections 7 to 12, 25 to 34, 37, 40, and 41 of the Metropolis Gas Act, 1860.

15.—To provide for the payment of the costs and expenses of and incidental to the intended Act by the Council as payments for general county purposes within the meaning of the Local Government Act, 1888, or otherwise in such manner as may be defined in the intended Act.

16.—To vary and extinguish all or some of the rights and privileges which it may be necessary or expedient to vary or extinguish for the purpose of carrying into execution any of the objects of the intended Act, or which would interfere with the objects of the Act; and to repeal, alter, or amend all or some of the provisions of the several Acts hereinbefore mentioned or referred to, and any other Act or Acts relating to any of the Gas Companies

THE "LANCET" ON INCANDESCENT GAS v. ELECTRIC LIGHT.

Some of our readers may doubtless remember that eleven years ago our medical contemporary the "Lancet" published the report of their Special Analytical Sanitary Commission on Gaseous Fuel, Gas Heating, and Gas-Cooking Appliances. In the course thereof, the following sentence occurred: "The incandescent burner, with recent improvements, is rapidly growing in favour, and we feel confident that this form of burner promises to play a very important part in the future; and, in any case, it is certain that there is still plenty of room for improvement in the methods of using gas as an illuminating agent." Our contemporary now points out that the report was written at a time when everybody confidently expected that the electric light would supersede entirely the use of gas for lighting purposes; and the writer goes on to say that there is little doubt this expectation would have been realized if what was at one time a rare element—thorium—had not been discovered, and the incandescent mantle had not been invented. "If," he says, "the modern householder's only recourse nowadays was to use a naked gas-flame with its attendant disadvantages of waste of gas, feeble illuminating power, and contamination of the air, he would not hesitate to decide in favour of electricity for lighting purposes. The incandescent mantle has, in fact, saved the gas industry; and not only saved it, but placed it in such a position that gas lighting by modern methods of high-pressure incandescence, inverted burners, and so forth, threatens to outstrip electricity for general lighting purposes. This is no exaggeration when we reflect that invariably the finest streets in the great cities of Europe are now lighted with incandescent gas-burners; and if the high-pressure incandescent lamps be compared with the electric arc lights at some of the busy street crossings in London, there can be no question of the great superiority of the incandescent gas system. In fact, in several places the electric arc lights may as well not be in use in the face of the brilliant penetrating light of the incandescent mantle. At a gas exhibition held at Earl's Court, there may be seen incandescent gas-burners working under pressure with the light of which the electric arc light cannot compete for brilliancy, steadiness, penetrating power, or tone. Nor is it on the large scale alone that gas is seriously rivalling electricity. The inverted incandescent gas-burner is hardly distinguishable in appearance from the incandescent electric light in the artistic lighting of domestic rooms. It gives a more brilliant light, consumes a surprisingly small quantity of gas, and the lamp may be decorated in the same way as the electric lamp. The incandescent mantle, while it has considerably cheapened the cost of gas to the consumer, has enormously increased the lighting power of the gas; and these are advantages which serve as a set-off to the undeniable convenience of the electric light, its cleanliness, and its absolutely negative effect upon the purity of the air. As a source of lighting power, gas is certainly cheaper than the electric light, now that the thorium mantle extracts so much lighting duty from it. We may, however, look confidently to important improvements being effected in electric lighting analogous to those which have been made with gas; and the great advances made in gas lighting are calculated to serve as a strong stimulus to this end. Bound as we are to admit the great convenience, cleanliness, comparative coolness, and harmlessness of the incandescent electric light, it is far from being a perfect method of illumination. For some not very clear reason, the light of the incandescent electric lamp seems to be wearying—taxing the muscles of accommodation of the eye; and a good many people complain that reading by the electric lamp gives rise to headache. Possibly the fact that the light is rich in red rays, especially when the lamp is not burning with full efficiency, may have something to do with it; or perhaps the distribution of the light from a loop instead of a fixed centre may have some disturbing effect upon the eyes. The pioneers of gas lighting have had a strong incentive in the growth of electric lighting to improve their system; and now it would seem that it is the turn of our electric lighting engineers to bestir themselves to introduce similar practical improvements, and to make similar brilliant advances to those which their competitors have made, or be left behind in the race."

Cost of a County Council Loan.—At the meeting of the London County Council last Tuesday, attention was called by Mr. S. Collins to the cost to the ratepayers of the money borrowed by the Council. He said that, in connection with the last issue of £5,000,000 of 3 per cent. stock, they offered it at 90 per cent., which meant an immediate sacrifice of £500,000. Now they had to meet a bill of £25,000 for incidental charges. It was well to consider what they were paying for borrowed money, especially in its effect on the rates. There was a great deal of want of employment in London, and notably in the East-end, due largely to the fact that the rates pressed so hardly on those who controlled factories that they were deserting London for parts of the country where the burdens were less insupportable.

Retford and the Electric Light.—A few days ago a special meeting of the Retford Traders' Association was held to protest against the adoption by the Corporation of an electric lighting scheme. Mr. Moss proposed, and Mr. Jenkins seconded, that a petition be presented to the Town Council to abandon the scheme proposed, for the following among other reasons: (1) That the electric light is not the light of the future, and is in no way likely to supersede gas either as an illuminant or for heating purposes; (2) that the price proposed to be charged per unit of electricity would so largely exceed that of gas (candle power for candle power) that sufficient customers would not be found to make the concern profitable, and the result would be failure; (3) that the number of consumers being small, it would be unfair to compel the general body of gas consumers, or ratepayers, to put down an installation, and to provide the annual establishment charges for the electric light, merely for the benefit of a handful of people who are well able to provide the electric light for themselves; (4) that Corporation electricity works would be a grievous burden either to the gas consumers or ratepayers, or both, and that the town is already too heavily burdened without any addition. The resolution was carried.

INCANDESCENT GAS LIGHTING IN STEPNEY.

At the Meeting of the Stepney Borough Council on Wednesday, the Works Committee reported that, in connection with the conversion by the Commercial Gas Company of certain street-lamps to the incandescent system, the Borough Engineer had brought under the Committee's notice the fact that 42 lamps in the borough are within the area of the Gaslight and Coke Company, and that he had approached the Company with a view to the conversion of these 42 flat-flame burners. It had been found, however, that the condition of the lamps in question is such as to necessitate their renewal; and the Gaslight and Coke Company had, under the circumstances, offered to supply and fix 42 new copper lamps, properly designed for incandescent lighting, for £91 10s. This sum would include the cost of making all the requisite alterations to the existing columns and brackets; and the Company were willing to accept payment in twenty quarterly instalments, free of interest. They were also prepared to enter into a contract for five years to light and maintain the lamps at the following rates per lamp per annum: 20 single-burner lamps (3940 hours), £3 3s. 3d. per lamp per annum; 18 single-burner lamps (4300 hours), £3 6s. 7d.; and 4 double-burner lamps (4300 hours), £5 17s. 8d. The Company intimated that they would keep the mantles in good lighting order, and that the charge for gas would vary according to the price for the time being charged by the Company for street lighting. All the lamps would be fitted with No. 4 Kern burners. It was resolved to accept the offer, and to enter into a five years' contract with the Company on the terms stated.

LEEDS GAS WORKERS AND THE UNEMPLOYED.

During the last few days, the Chairmen and Vice-Chairmen of the various labour-employing Committees of the Leeds Corporation have been taking steps to ascertain what work can be found for the unemployed. On Thursday they met at the Town Hall, under the presidency of the Lord Mayor (Mr. R. Armitage), and reported the result of their inquiries. It was stated by Mr. Freeman, the Registrar of the Bureau, that he had on his list about 1500 men waiting for work. At a meeting of the Gas Committee on Tuesday, under the presidency of Mr. G. Ratcliffe, a communication was placed before them, signed by Mr. J. E. Smith, on behalf of the National Union of Gas Workers and General Labourers, as follows: "We had a meeting of Leeds gas workers on Sunday last to consider a suggestion made by Mr. Lowden at a conference of the unemployed in the Town Hall; and, as a result, the men unanimously decided to ask the Committee to abolish Sunday work. The men never were desirous of Sunday labour; and if you agree to this application, it will mean the lighting up of a number of retorts now doing nothing, and give employment to a larger number of men. If there is not sufficient storage capacity to allow the retorts to stand on Sunday, we ask you to take steps to provide increased storage, which may also find work for a number of the unemployed. I hope you will give this your favourable consideration." The feeling of the Committee with regard to the proposition was that extra storage capacity could not be provided for many months, and that meanwhile something should be done. According to an agreement of 1890, work was to be found for the men six days a week, excluding Sundays. What the Committee suggested was that the men should accept Sunday as one of the six working days. If this were done, work could be found for one-seventh more men than are at the present time employed.

The proposal was discussed on Thursday at a conference between the Committee and the representatives of the men—Mr. Smith, Mr. Walt Wood, and nine men from the different works. The men, as will have been seen, are opposed to Sunday work altogether, and their representatives again urged that its abolition would mean the employment of an additional number of men. The General Manager (Mr. R. H. Townsley), however, pointed out that the abolition of Sunday work was impracticable; while, in reply to a suggestion that increased storage should be provided, he reminded them that to erect a new gasholder would entail an expenditure of something like £60,000 or £70,000. Moreover, this would not relieve the present distress, inasmuch as the acquisition and clearing of a site, and the preparation of plans, would make it impossible to begin the construction of the holder for many months. The Committee suggested that their scheme should be tried for three months, and that then the men should decide, if necessary by ballot, whether or not they are willing to continue to work under the new system.

GAS AND WATER SUPPLY IN NORTH-EAST SUSSEX.

Starting New Works.

For some little time past, schemes have been in progress for providing a more adequate supply of gas and water in the north-eastern portion of Sussex; and Tuesday last witnessed their satisfactory completion.

Dealing first with gas, the works of the Wadhurst, Ticehurst, and District Gas Company, which are situated in the first-named town, have been judiciously extended to satisfy the increased requirements of a growing district and to make provision for the demands of the future. There are also gas-works at Ticehurst owned by the Company, which have recently been enlarged by the erection of a gasholder and the addition of retorts. Since the new Company took over the works and business, the consumption of gas has grown considerably—a fact that is probably attributable to the introduction of prepayment meters and stoves. The official ceremony of inaugurating the extensions was performed in the morning of the above-named day, at Wadhurst, by the Chairman (Dr. W. White), who congratulated the shareholders on the completion of the work and the progress made by the undertaking. Mr. Hugh Stott, the Medical Officer of Health for the combined districts, advocated the increased use of gas-stoves for cooking—a practice which, he contended, should be encouraged from the point of view of health as well as for economical reasons.

In the afternoon, there was a large assemblage of Directors, shareholders, and guests to witness the opening ceremony of the starting the engines, performed by the Hon. T. A. Brassey at the works of the Ticehurst and Robertsbridge Water Company at Burwash. An Act

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 678.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 13	10½	Alliance & Dublin 10 p.c.	20½—21½	..	4 17 8
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
200,000	5	Nov. 11	6½	Bombay, Ltd.	6—6½*	..	5 0 0
140,000	5	,,	6½	Do. New, £4 paid	4½—5*	..	5 4 0
50,000	10	Aug. 31	14	Bourne- 10 p.c.	29—30	..	4 13 4
251,810	10	,,	7	mouth Gas B 7 p.c.	15½—16½	..	4 4 10
53,200	10	,,	6	and Water Pref. 6 p.c.	14½—15½	..	3 17 5
380,000	Stk.	Aug. 12	12	Brentford Consolidated	242 - 247	+5	4 17 2
300,000	,,	,,	9	Do. New	185—190	+5	4 14 9
50,000	,,	,,	5	Do. 5 p.c. Pref.	125—130	..	3 16 11
206,250	,,	June 10	4	Do. 4 p.c. Deb.	104—107	..	3 14 9
220,000	Stk.	Sept. 15	11	Brighton & Hove Orig.	218—223	+6	4 18 8
246,320	,,	,,	8	Do. A. Ord. Stk.	160—165	+10	4 17 0
460,000	20	Sept. 29	10	British	40 - 41	+½	4 17 7
100,000	Stk.	Aug. 12	6	Bromley, Ord. 5 p.c.	117—122	+2	4 18 4
165,700	,,	,,	4½	Do. do. 3½ p.c.	92—93	+1½	4 13 9
500,000	10	Oct. 13	7	Buenos Ayres (New) Ltd.	11¼—11⅝	..	5 19 2
250,000	Stk.	June 29	4	Do. 4 p.c. Deb.	94—96	+1	4 3 4
150,000	20	July 14	8½	Cagliari, Ltd.	22—24	..	6 17 6
100,000	10	Sept. 29	10	Cape Town & Dis., Ltd.	14½—14⅝	..	6 15 7
100,000	10	Oct. 27	4½	Do. 4½ p.c Pref.	9½—9¾	+¼	4 12 4
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	51—53	..	5 13 2
50,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk.	99—101	+1	4 9 1
1,375,000	Stk.	Aug. 31	5⅛	Commercial 4 p c Stk.	110—112	+1	4 12 10
560,000	,,	,,	5	Do. 3½ p.c. do.	106—108	+1	4 12 7
450,000	,,	June 10	3	Do. 3 p.c. Deb. Stk.	86—88	..	3 8 2
800,000	Stk.	June 10	6¼†	Continental Union, Ltd.	103—106	..	6 2 8
200,000	,,	,,	7	Do. 7 p c. Pref.	135—140	..	5 0 0
486,190	10	July 14	11	European, Ltd.	193—203½	..	5 7 4
354,060	10	,,	11	Do. £7 10s. paid	14—15	..	5 10 0
15,243,200	Stk.	Aug. 12	4⅛	Gas- 4 p.c. Ord.	97—99	+4	4 8 10
2,600,000	,,	,,	3⅜	light 3½ p.c. max.	90—92	+1	3 16 1
3,799,735	,,	,,	4	and 4 p.c. Con. Pref.	108—110	+1	3 12 9
4,193,975	,,	June 29	3	Coke 3 p.c. Con. Deb.	87—89	..	3 7 5
258,740	Stk.	Sept. 15	5	Hastings & St. L. 3½ p.c.	90—95	..	5 5 3
70,000	10	Sept. 29	11	Hongkong & China, Ltd.	15—16	..	6 17 6
13,800,000	Stk.	Nov. 11	10	Imperial Continental	206—208*	..	4 16 2
473,600	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	96—98	..	3 11 4
175,036	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c.	115—120	..	5 0 0
561,000	Stk.	Aug. 31	10	Liverpool United A.	218—220	..	4 10 11
718,100	,,	,,	7	Do. do. B	159—161	..	4 6 11
306,083	,,	June 29	4	Do. do. Deb. Stk.	107—109	..	3 13 5
75,000	5	June 29	5	Malta & Medn., Ltd.	4¼—4⅝	..	5 5 3
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	102—104	..	4 16 2
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	Nov. 11	3½	Monte Video, Ltd.	10—11*	..	6 7 3
1,515,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con.	107—109	+½	4 2 7
406,025	Stk.	July 1	3½	Do. 3½ p.c. Deb.	92—92½	..	3 15 8
15,000	10	Aug. 31	10	North Middlesex 10 p.c.	19½—20½	+½	4 17 7
52,940	1	,,	7	Do. 7 p.c.	13½—14½	+½	4 16 7
300,000	Stk.	May 12	8	Oriental, Ltd.	145—150	..	5 6 8
600,000	5	Sept. 15	7	Ottoman, Ltd.	5½—6½	..	5 12 0
235,005	Stk.	—	6½	Plym'th & St'house 5 p.c.	—	..	—
398,490	5	Apl. 28	5	Primitiva Ord.	5½—6	+¼	4 3 4
796,980	5	July 28	5	Do. 5 p.c. Pref.	4½—5	..	5 0 0
488,900	100	June 1	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
851,070	10	Oct. 13	7	River Plate Ord.	11½—12	..	5 16 8
300,000	Stk.	June 29	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
250,000	10	Sept. 15	6	San Paulo, Ltd.	12—12½	—¼	4 16 0
70,000	50	June 29	5	Do. 5 p.c. Deb.	51—53	..	4 14 4
135,000	Stk.	Sept. 15	10	Sheffield A	237—239	..	4 3 8
209,984	,,	,,	10	Do. B	237—239	+1	4 3 8
523,498	,,	,,	10	Do. C	236—238	..	4 4 0
123,998	Stk.	Sept. 29	5	Shrewsbury Ord. 5 p.c.	104½—107½	..	4 13 0
70,000	10	,,	11	South African	16—17	..	6 9 5
6,250,000	Stk.	Aug. 12	5½	South Met., 4 p.c. Ord.	128—130	+1	4 4 7
1,832,700	,,	July 14	3	Do. 3 p.c. Deb.	88—90	..	3 6 8
575,000	Stk.	Aug. 31	5½	S'th Suburb'n Ord. 5 p.c.	121—124	+2	4 8 9
60,000	,,	,,	5	Do. 5 p.c. Pref.	120—125	..	4 0 0
112,533	,,	July 14	5	Do. 5 p.c. Deb. Stk.	133—138	..	3 12 0
380,940	Stk.	Nov. 11	5	Southampton Ord.	103—107*	..	4 13 6
87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Aug. 31	6½	Tottenham A 5 p.c.	122—127	+2	4 18 5
325,520	,,	,,	4½	and B 3½ p.c.	97—102	..	4 13 2
115,000	,,	June 29	4	Edmonton 4 p.c. Deb.	104—107	..	3 14 9
182,380	10	June 10	8	Tuscan, Ltd.	8¼—8⅝	..	9 2 10
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	96—98	..	5 2 0
30,000	Stk.	Aug. 31	7½	Wands- A 5 p.c.	155—160	+5	4 16 11
255,636	,,	,,	6½	worth B 3½ p.c.	123—128	+3	4 17 8
51,299	,,	,,	5⅞	and C 3½ p.c.	105—110	+3	4 18 8
57,564	,,	June 29	3	Putney 3 p.c. Deb. Stk.	78—83	..	3 12 8
745,872	,,	Aug. 12	5	West Ham 5 p.c. Ord.	99—101	+1	4 19 0
85,000	,,	,,	5	Do. 5 p.c. Pref.	117—122	..	4 2 0
160,000	,,	June 29	4	Do. 4 p.c. Deb. Stk.	103—108	..	3 14 1

Prices marked * are Ex div. † Next dividend will be at this rate.

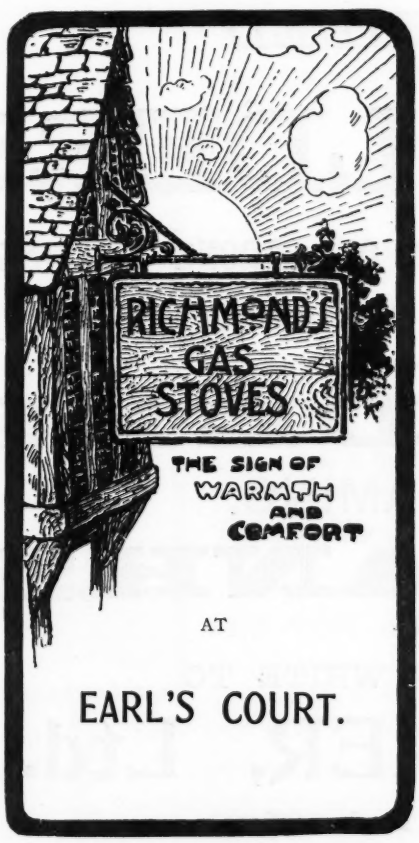
obtained in 1902 authorized the Company to serve the parishes of Ticehurst, Etchingham, Salehurst, Burwash, and Robertsbridge. A subsequent Act gave them power to extend their scheme to Heathfield, and at the same time sanctioned an amalgamation with the Wadhurst, Ticehurst, and District Gas Company, who also had obtained the necessary statutory powers. This amalgamation will take effect next month. The total area which the Water and Gas Company propose to supply with water is 34,094 acres, and it has a population of 10,338, with a rateable value of £52,886. The reservoir at Burwash Common, the first turf of which was cut in May by Lord Brassey, is constructed of concrete, and is capable of holding 150,000 gallons; while provision is made for duplicating its capacity if occasion requires. From a well 8 ft. 6 in. in diameter and 65 feet deep on the Battenhurst Park estate, near Ticehurst, 6 million gallons of water were obtained during a 20 days' pumping test, and it was certified by the Public Analyst as excellent. All the machinery is in duplicate, and capable of lifting 7000 gallons of water an hour. The engineering work has been carried out by Mr. G. H. Perryn. The Managing-Director is Mr. E. Eaton, who is also Engineer and Managing-Director of the Wadhurst Company. The opening ceremony was followed by a luncheon.

TORONTO CONSUMERS' GAS COMPANY.

We have received the report of the Directors of this Company for the year ending the 30th September last, together with the accounts for this period, which are signed by the General Manager and Secretary (Mr. W. H. Pearson). We learn therefrom that the output of gas amounted to 1,232,961,000 cubic feet; being 106,434,000 feet more than that of the previous year. This largely increased output has rendered necessary very considerable extensions to the Company's storage and distributing plants. During the year, nearly 8½ miles of new mains were laid—making the total length upwards of 287 miles; and 2629 new services were put in. A contract has been entered into with Messrs. C. & W. Walker, Limited, for the construction and erection of a gasholder, with a steel tank, having a capacity of 3 million cubic feet. A contract has also been entered into for the construction of an overhead coke storage and measuring plant, by which it is expected a large saving in the handling of coke will be effected. In addition, it has been found necessary to erect a new machine shop and storage house, and to substitute larger and improved boilers and exhausters for those formerly in use; also to enlarge and remodel the boiler-house and put up a much higher chimney. To meet the requirements of the Company in the near future, a large plot of land, eligibly situated, with railway and drainage facilities, has been purchased. It is intended to construct on it an additional set of works. On the 10th of November last year, the Company's coal-storage and coke house, together with the coal and coke conveying apparatus contained therein, were almost entirely destroyed by fire. The loss was, however, fully covered by the insurance. In the last session of the Ontario Legislature, the Directors obtained a Bill empowering them to add $1,500,000 to their authorized capital stock, divided into shares of $50 each, and in the same session, the City of Toronto obtained power to purchase any stock or shares in the Company, provided the general consent of the ratepayers entitled to vote on money bye-laws should be first obtained for the purchase of stock; and in the event of the City holding stock in the Company to the amount of a par value of $10,000 or more, and so long as a holding to this amount should continue, the head of the Corporation was to be *ex officio* a Director of the Company. The gas-rental last year amounted to $905,858, compared with $855,522 before—an increase of $50,336.

SOUTH HOLDERNESS WATER SUPPLY.

When referring to the above subject in the "JOURNAL" last week (p. 635), it was stated that Mr. F. G. Bancroft, the Water and Gas Engineer to the Hull Corporation, had submitted a report to his Committee on the practicability of the Corporation supplying South Holderness and Hornsea with water. We have since received from Mr. Bancroft a copy of the report, from which we take the following particulars. He says that the area in question could be provided with water if an arrangement were made for the Corporation to supply it in bulk, as they have not only sufficient for Hull, but could supply what might be required for Holderness. The nearest serviceable main is a 12-inch one; and it terminates 3000 yards within the city boundary. A pumping-station would be required at or near the boundary, with engines and pumps receiving the water from the main and delivering it at a pressure of (say) 250 feet. From this station a 12-inch main would have to be laid to Hedon, and then divide first into the Hornsea branch, commencing with a 10-inch pipe diminishing to a 9-inch and to an 8-inch at Hornsea, and, secondly, into the Withernsea branch, commencing with a 10-inch pipe and diminishing to a 9-inch and to an 8-inch at Withernsea. The pressure of 250 feet at the pumping-station would be sufficient to deliver at 120 feet above Ordnance datum at Hornsea and Withernsea. The population of the Hornsea district in 1891 was 7201, and in 1901 it was 7495; that of the Withernsea district was 8428 in 1891, and 8639 in 1901—an increase of only 505 in ten years. If all the inhabitants (16,134) were supplied, the quantity required, at 30 gallons per head, would be 484,020 gallons per day. Mr. Bancroft says that at present it would be sufficient to provide for the supply of 5249 people in Hornsea and 6623 in Withernsea, allowing for the summer increase. The estimated cost of the supply would be £39,793—say, in round figures, £40,000. The revenue charges, including interest and sinking fund, would be £5421, and the receipts (reckoning 91¼ million gallons, at 1s. 3d. per 1000 gallons) £5703. In the foregoing estimate, no provision is made for water tanks and towers. In conclusion, Mr. Bancroft points out that the water charges would have to be based on a cost of 15d. per 1000 gallons, *plus* distribution expenses.



All
Wearing
Parts
Removable
for
Cleaning
and
Repair.

METROPOLITAN WATER ARBITRATIONS.

New River Company's Award.

Mr. Arthur Paget, the Secretary of the Court of Arbitration appoin'ed under the Metropolis Water Act, 1902, to assess the amount to be paid to the Metropolitan Water Companies on the transference of their undertakings to the Metropolitan Water Board, last Friday gave notice of the finding of the Arbitrators (Sir Edward Fry, Sir Hugh Owen, and Sir John Wolfe-Barry) in the case of the *New River Company v. Metropolitan Water Board*. The hearing of the case commenced on Nov. 19 last year, and was continued on subsequent days down to Dec. 3. During the hearing, questions of law arose, and were stated by the Arbitrators in the form of a special case for the opinion of the Court of Appeal. On the finding of that Court, there was an appeal to the House of Lords, who made an order on July 18 last affirming the Arbitrators' decisions on four of the questions. As a consequence, in the course of the subsequent proceedings, the Company's claim of £13,260,164, based on the capitalized value of an income of £350,000 a year, was reduced to a little more than £8 000,000, less the value of the Clerkenwell Estate. Having ascertained that the landed estates, houses, and properties, and books, accounts, and documents excepted out of the Company's undertaking by the first sub-section of section 9 of the Act were those which were specified in a schedule which had been signed by the Governor of the Company and by a Secretary of the Local Government Board, and the parties having by agreement ascer tained and determined what parts of the offices and premises in Rosebery Avenne and the office furniture and fittings therein were excepted out of the undertaking, the Arbitrators by their award decreed that the sum payable to the Company by the Water Board as compensation for the transfer of their undertaking, except as before mentioned, and also for covering any costs, charges, and expenses (other than those incurred in the arbitration) which had been, or were likely to be, incurred by the Company in consequence of the passing of the Act of 1902, and which ought, in the opinion of the Arbitrators, to be borne by the Board, should be discharged by the issue by the Water Board to the Company of water stock to the amount of £6,534,000. The costs incurred by the Company in the arbitration as between solicitor and client are to be paid by the Board when taxed.

Compensation to Directors.

Last Friday, Lord REVELSTOKE, the Arbitrator appointed by the Local Government Board, resumed at the Westminster Palace Hotel his hearing of the claims to compensation brought under the Metropolis Water Act, 1902, by the Directors of the London Water Companies, whose undertakings have been acquired by the Board constituted under that Act. The previous proceedings in the arbitration, were reported in the "JOURNAL" for the 1st inst. (p. 348). The claim of the Directors of the Lambeth Water Company, which amounted to £32,000, was first considered.

Mr. C. A. CRIPPS, K.C., M.P., and Mr. J. FOX appeared for the claimants; Mr. HONORATUS LLOYD, K.C., and Mr. A. B. SHAW represented the respondents.

Mr. CRIPPS, in opening the case, said the object of the inquiry was to ascertain the amount payable by way of compensation for loss of office by the Directors of the Company. The sum of £3300 had been annually allocated since 1897 to the Board for their services; but they could not claim in regard to the whole of this amount, as one of the Directors had been appointed since the passing of the Act. The point was as to how this amount was to be capitalized. No revolutionary principle of turning Water Companies' directors out of their office, when once they had been elected, had hitherto been suggested.

Lord *Hampden*, the Chairman of the Company, who has been a Director since 1886, gave evidence to the effect that he looked on his position as a freehold life tenure.

In cross-examination by Mr. LLOYD, witness said that no Director in this case would get more than the equivalent of his fees. A specific sum was paid to the Chairman out of the total amount allocated, and the remainder was divided among the other Directors.

Mr. LLOYD then addressed the Arbitrator on behalf of the Water Board, contending that as the Directors were subject to re-election, their claim could not be based on the principle affecting freeholds and leaseholds, and ought to be regarded as terminable interests. He argued for the compensation to be based on a five years' purchase.

Evidence was given for the Board in favour of the "English life" table being the basis to be adopted in assessing the compensation, thereby reducing the claim to £24,236.

Mr. CRIPPS, in reply, contended that the office of director should be treated on the principle of life interest.

The Arbitrator reserved his award.

The case of the Grand Junction Company was next heard. The claim of the Directors was £23,300, and a portion of it concerned a sum of £450 a year paid to three of the members of the Board in regard to the Staines Reservoirs Joint Committee. The Directors' fees at the time of the passing of the Act were £2500 a year. The average age of the Directors was 65.

The award was reserved.

The case of the West Middlesex Company was then taken.

Mr. BAGGALLAY, K.C., on behalf of the Directors, claimed £43,470. At the outset, he asked the Arbitrator to give him an opportunity of raising a special case as to the distribution of the award; but subsequently he stated that the Company were prepared to undertake the responsibility of distribution. There were twelve Directors, and eleven of them were entitled to compensation. The average age was 65 to 66. On the Post Office annuity table system, they would be entitled to £44,165; and under the Government average system, to £43,972. On an average of five years, the Directors had been receiving at the rate of £3380 annually. Three of the Directors also sought to claim for compensation in respect to the Staines Reservoirs Joint Committee.

The Arbitrator reserved his award.

SPIRAL GUIDED
GASHOLDERS
WITH WALKER'S IMPROVED METHOD OF STRONG PLATING
FOR ATTACHMENT OF GUIDES.
GASHOLDERS
WITH GUIDE-FRAMING.
STEEL TANKS.
FOR FULL PARTICULARS WRITE TO
C. & W. WALKER, Ltd.,
Midland Iron-Works:
DONNINGTON, NEWPORT, SALOP.
London Office:
110, CANNON STREET, E.C.

The claims of the Southwark and Vauxhall Company, amounting to £25,964, the Chelsea Company to £18,000, and the Kent Company to £21,000 were also considered, and the awards reserved.

At the previous hearing, his Lordship was engaged with the case of the Directors of the New River Company, who claimed £110,000, or ten years' purchase of their annual fees, as compensation for loss of office. He has awarded £72,400.

METROPOLITAN WATER BOARD.

The Fortnightly Meeting of the Board was held on Friday, at the offices of the Metropolitan Asylums Board—Sir R. M. BEACHCROFT in the chair.

The Finance Committee reported that they had considered the resolution of the Board of the 28th ult., instructing them to report fully on the question of the rebate of 5 per cent. allowed to the consumers in the West Middlesex district; and they submitted certain particulars for the information of the Board, in order that they might decide whether or not the rebate should be continued in respect of the quarter's water-rate to be levied to Lady Day, 1905. Having set forth the circumstances under which the allowance had been granted, they came to the conclusion that, under the existing conditions, it was a bounty to one section of the water consumers of the Metropolis; and they did not think it would be equitable, or that the Board would be doing their duty to the ratepayers, if they continued the rebate, unless it were proved that they were clearly bound to do so. In the opinion of the Committee, such proof was not forthcoming. They also considered that it was contrary to the intention of the Metropolis Water Act, 1902, to grant rebates or discounts; for Parliament clearly contemplated the early establishment of uniform rates throughout the Metropolis. It could not be said that the water consumers in the West Middlesex district had any claim to special consideration; for that district, in common with the New River, the Grand Junction, and the Chelsea districts, enjoyed the lowest scale of water-rates in the Metropolis. The Committee therefore thought it was undesirable that a rebate should be continued in the case of a scale already low; and they recommended—"That the Board do continue the rebate in the West Middlesex district until the end of the present financial year; at the same time giving immediate intimation to the consumers in that district that the rebate will be discontinued on March 31, 1905."

Mr. C. F. PRITCHARD moved, as an amendment, that after the word "until" the following words should be substituted—"a uniform scale of charges applicable throughout the whole limit of supply has been adopted."

After considerable discussion, the amendment was lost by 10 votes to 35. Another amendment was then moved to refer the recommendation back to the Committee; and it was carried by 24 votes to 17.

The Works and Stores Committee presented the statistical return for October by the Engineer (Mr. W. B. Bryan, M.Inst.C.E.). It showed that the total average daily supply in all the districts was 218,593,000 gallons. The number of houses, &c., supplied was 995,890; while the total population was estimated at 6,592,601. The supply per head per day during the month was 33·1 gallons (mean), as against 32·4 gallons in the corresponding month of last year. The water in store in impounding reservoirs at the end of the month was 3185 million gallons, in addition to which there were 3300 million gallons in store in the Staines reservoirs. The number of additional supplies (including trade) laid on during the month was 1663; and the length of new mains was 6756 yards. The mean rainfall of all the districts was 1·55 inches. During the month there were 322 fires in the several areas.

A report was presented by the Special Arbitration Committee in regard to compensation for the loss of office sustained by the Directors of the Water Companies. The case of the New River Company came before the Arbitrator appointed by the Local Government Board—Lord Revelstoke—on Oct. 26 (*ante*, p. 348). The Company's claim of £110,913 8s. 4d. represented ten years' purchase of £11,091 6s. 10d., the amount of the fees paid during the year 1903 to the whole of the 29 Directors of the Company, with the addition of the income-tax paid thereon. The number of Directors in respect of whom compensation could, under the provisions of the Water Act, 1902, be claimed was 25. Of these, it was ascertained that 17 were the nominees of various corporations and private persons who nominated these Directors to act in their stead; and, further, that, on an average of the last five years, a sum of £1092 was annually paid over by certain of these gentlemen to the actual owner or owners of the shares. Counsel for the Board urged that the maximum amount allowed should be five years' purchase of the average fees received by the Directors for the last five years, amounting to £9506 8s. 3d., less the above-named sum of £1092, or £8414 8s. 3d., and that no addition should be made in respect of income-tax hitherto paid on the Directors' fees. The amount of the award was £76,917 17s. 10d. If the contention of the Board had been upheld on all points, and five years' purchase given of the average annual fees, less the amount not retained by the Directors, the amount would have been £42,072 1s. 3d. The Board had no option but to pay the sum awarded; and the Committee had therefore asked the Finance Committee to recommend the Board to order its payment.

The CHAIRMAN, in moving the adoption of the report, informed the Board that the award of the Court of Arbitration had that day been given in the New River Company's case. The amount of the award was £6,534,000. [Some details of the award are given on p. 714.] The total in cash which the Board were paying for the eight undertakings was £30,662,323, which, translated into stock at £91 6s. 6d., was £33,575,243. This represented what the Board had paid for the eight undertakings; and, in addition, the debenture charge amounted to about £300,000 a year. At the next meeting of the Board, he hoped that the Arbitration Committee would be able to present a full report on the subject.

The report was adopted.

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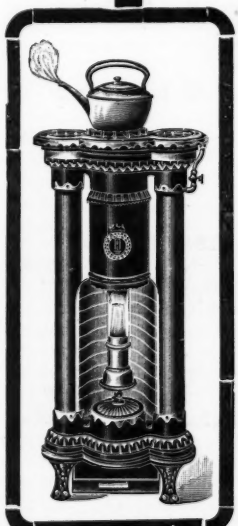

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

What may be truly described as a field night took place in the Falkirk Town Council, at a special meeting on Tuesday, over the matter of the alteration of the levels at the new gas-works in course of erection, to which I referred at length last week. Before going further into the matter, I may say that I have satisfaction in stating that the Town Council took the view which was contained in my "Notes" last week, and not only exonerated Mr. W. M'Crae, the Engineer and Manager, from all blame, but, in the same resolution, they found that Mr. H. Russell, the Convener of the Works Committee, was aware of the alteration of the levels, and failed to bring it under the notice of the Committee. This is a very satisfactory ending of the matter so far as Mr. M'Crae is concerned; and it is to be hoped that it will not go any further. As to this, however, I am not quite sanguine. The proceedings began by Provost Christie intimating that two letters bearing on the subject had been received, and that he thought they should be read. There was some objection to this. The Council therefore divided; and it was agreed that the letters should be read. The first was from the Works Manager of the Falkirk Iron Company, and was intended to be a refutation of a statement by Provost Christie, as reported in the local newspapers, to the effect that the Railway Company had altered the level of their proposed railway to suit the Falkirk Iron Company and others. This Company, the writer said, never suggested such a thing; and, as matter of fact, the level of the railway did not affect them. The other letter was from Mr. C. Massie, the Water Superintendent, and was to the effect that he was present at the new gas-works when the first batch of concrete was being put down, and he saw Mr. M'Crae show Mr. Russell a plan with tracings upon it, and overheard Mr. M'Crae say to Mr. Russell that this meant raising the level of the works.

Mr. Russell then addressed the Council. He hoped, he said, to be able to prove that Mr. M'Crae's report was simply a tissue of insinuation and misrepresentation. It would be an easy matter for him to produce facts to rebut the insinuation in regard to his association with the Falkirk Iron Company in this matter. That was an old insinuation, which had done duty now for several years. Provost Christie reminded him that this was an old matter, and that they could not go back upon it. Mr. Russell complained of being interrupted. The only interpretation which could be placed on the reference which had been made to the Falkirk Iron Company was that he was under the influence of that Company, and that he had yielded to that influence at the expense of the town. Mr. M'Crae had stated that he had got the levels which had been departed from in the beginning of August; and if he (Mr. Russell) had been the means of their being departed from in the beginning of August, he stood there a proud man. He was proud of it, as the deviation had been the means of saving the town many thousands of pounds, because the works would be placed on a level both with the railway and the canal, and they would get the advantage of competitive rates from both sources of transit, in bringing the coal they required into the new gas-works. Had the works been on a lower level, the canal would have been virtually of no use to them. Mr. M'Crae got his levels in the beginning of August, and the plans were passed by the Dean of Guild Court in the month of September. If the plans that were passed by that Court did not contain the proper levels, why not? It would amaze them to know that, while they had passed plans, half of them contained the old level, and the other half the improved level. He thought this was sufficient proof of the value of the report that was read to them on Friday last from Mr. M'Crae. It was just a tissue of misrepresentation. He was simply amazed at the difference in the work which was being done at the gas-works and that which was sanctioned in the plan produced at the Dean of Guild Court. He had seen the plan in the Town Clerk's office that day. . . . He was astonished to find, on inquiry from the Town Clerk, that these deviations were going on, and the deed of contract had not yet been signed. The Engineer had no right to make these deviations without consulting the Town Council and the Gas-Works Committee, which had been the practice during the four or five years he had been connected with the gas-works. Mr. M'Crae had simply ignored them, not only in connection with the new gas-works, but also in connection with the old works. He had given them ample evidence of this in Committee the other night; and if Mr. M'Crae would deceive him, was it not as natural that he would deceive them? If the evidence he had given was not sufficient to show them that he was utterly powerless, he did not know what evidence was. He recommended them to calmly go and look at the gas-works site, if any of them thought that the deviation was a serious one. It was said that the Railway Company had deviated from their plans and their agreement. This was a downright mistake. It was utterly impossible for any man to go there and examine the ground, and contend that they could do anything else than they were doing. The mistake was that the Gas Engineer went on with his works without thinking for a moment what his levels were to be. From his own report, they would see that he had only to ask the Railway Company what his levels were, and he would have got them. He did not want to leave any doubt in their minds with regard to the matter; and they were not to spare him if they thought they had cause for it.

Mr. M'Crae said he was placed in a painful position in having to reply to such accusations as had been thrown at him right away. With regard to what Mr. Russell had termed the insinuation that was contained in his report with regard to the Falkirk Foundry, he gave that the denial it deserved, and there was no insinuation against Mr. Russell whatever. This report contained a truthful rendering of what Councillor Russell told him on the ground; and he had no wish to insinuate anything with regard to him. Concerning the alterations which were being made on the works, and which were not marked on the Dean of Guild Court plan, he pointed out that the building of the retort-house

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SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont.)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
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SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2nd Cont.)	300,000
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TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
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was going on before the plans were lodged; and it was for the information of the Contractors that the matters complained of by Mr. Russell were now put upon the plan. In all his experience, he had never put a complete plan with regard to Parliamentary work of that sort before a Dean of Guild Court, or any court whatever. As to his having deceived them with regard to the acceptance of offers for pipes, &c., that was the most serious accusation against him of the lot. He had, however, to point out that he received the offer on the 27th of September; he accepted it on the 28th of October; and the first portion of the material was delivered on the 1st of November. The pipes that he had accepted at any other time were those of 24 and 12 inches diameter, and he was instructed by the Council to accept them. As to the work at Larbert, to which Mr. Russell had referred, he did not think it was necessary to report to the Committee with regard to this work. He, however, saw from the Standing Orders of the Council that he was wrong; and he gave them a guarantee that it would not happen again. Bailie Russell said that Councillor Russell had wandered from the subject of discussion, and missed the point. He moved that the Town Council resolve that the levels of the new works, as shown on the plans passed by the Town Council and the Dean of Guild Court, had been departed from; that Councillor Russell, the Convener of the Gas-Works Committee, was aware of this departure, and failed to bring it under the notice of his Committee; and that the Gas Manager be exonerated from all blame, as he had advised his Convener of the departure. Mr. Wilkie moved that the part of the motion exonerating Mr. M'Crae be deleted. He considered they could not relieve Mr. M'Crae of the responsibility of reporting to his Committee when he became aware that the levels were being altered. After discussion, the Council, by six votes to five, preferred Bailie Russell's motion. Bailie Bogle then moved that, before coming to a judgment in the matter, they call in an outside consulting engineer to examine the works and give them a complete report as to how they now stood, so that the Council could compare the work, so far as it had gone, with the Dean of Guild Court plans. He did not, he said, wish to cast blame on anyone; but he would like to get at the bottom of the question, for the good of the ratepayers. There was a measure of blame all round; and he held that the Town Council were more to blame than anyone. He believed that Mr. M'Crae had done the work as well as he could have done it in the circumstances; but he had done it without authority. If the statement of Mr. Russell were correct, that the works, so far as they had gone, did not conform to the plans as passed by the Dean of Guild Court, then a very grave act had been done, and they ought to get to the bottom of it. Bailie Russell thought that to call in an outside engineer would only incur expense and create confusion. When Mr. M'Crae was the Gas Engineer, he was responsible to the Council only, and Mr. Russell had no right to interfere with him. They would have to appoint another Committee to deal with the new gas-works. This motion was put against the original motion, which was again preferred, by six votes to four. Mr. Fairlie then moved a motion to the effect that they find that an alteration had been made without the consent of the Town Council, but considered that a misunderstanding had taken place, and that no blame was attached to any party, but that, in future, Mr. M'Crae be asked to report direct to the Town Council before making any alteration on the plans that had been passed. This amendment was put against the original motion, which was again carried by six votes to five. Mr. Russell did not vote in this division. At last, the end was reached by Bailie Russell giving notice of a motion that a small Committee be appointed to take charge of the new gas-works during their erection. The Council could scarcely have come to any other conclusion than they had. It was a misunderstanding at the beginning; and why Mr. Russell should have imported so much outside matter into the business is difficult to understand. The only serious act which was done was in the departure from plans which had been formally sanctioned, because it is making a travesty of the holding of a Dean of Guild Court for the consideration of plans if they are to be departed from after they are sanctioned. But it must not be forgotten that there was great hurry in this instance, and that any deviation from plans could have been sanctioned afterwards, and nobody have been the worse. No step in this direction appears to have been taken; and it is to be observed that the Town Council have not yet agreed to the deviation. In this connection, it is permissible to ask where the Town Clerk is; because he is the official who should keep the Council right in all such matters.

At the ordinary monthly meeting of the Falkirk Town Council on Monday, the Gas-Works Committee submitted a minute in which they stated that Mr. M'Crae had reported to them as to his visit to the gas-works at Derby, when tests of the De Brouwer charging and discharging machines with Scotch coals of different varieties were carried out, and as to the acceptance of the offer of Messrs. R. Dempster and Sons, Limited, of Elland, for the new retort-bench. The report was approved of; and it was agreed to recommend the Council to adopt the De Brouwer charging and discharging machines for the new works. Bailie Mitchell asked if it was intended to dispense with West's machine to take in that of De Brouwer. Provost Christie said that was so. Treasurer Lochhead thought that, before they committed themselves, they should get more information. He moved that the matter be remitted to the Joint Gas, Finance, and Works Committees. This was agreed to.

On Thursday morning a fire broke out in the oil-gas works belonging to the North British Railway Company in Hunter Street, Glasgow. The City Fire Brigade were summoned; and while they were at work, an explosion occurred in one of the iron storage tanks or cylinders which are used in connection with the process. The tank was of boiler shape, some 20 feet long. By the explosion, a hole about 2 feet long was torn in the side of it; and a large mass of flame bursting out, rather severely burned one of the firemen who was standing at the spot. About ten minutes afterwards another tank exploded, but no one was injured by it.

Of late there have been several unpleasant explosions in Dundee in the manholes connected with the system for the distribution of electric current. The subject was matter of discussion at a meeting of the Tramway Committee of the Town Council on Monday evening. The Electrical Engineer attributed the explosions to an old and defective form of connection box, of which there are a few still in existence.

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He also stated that in many of the manholes opened there were traces of coal gas found. Mr. Stevenson, the Convener of the Gas Committee, repudiated that the explosions were due to accumulations of coal gas. In general, he said, the connections of the street mains were in good order, and he maintained that there was nothing to show that recent mishaps were due to any deficiency in the plant of the Gas Department. The Engineer was instructed to have modern connection boxes introduced; and the subject was allowed to drop.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 26.

Sulphate of Ammonia.

Again there has been good demand, at slightly hardening prices in the early part of the week, and at a sharp advance near the close, everything offering being disposed of. There has been some direct business, but in the main the purchasing appears to have been for the purpose of covering speculative sales made in advance and due for delivery. The closing quotations are £12 13s. 9d. per ton f.o.b. Hull, and £12 17s. 6d. per ton f.o.b. Liverpool, and £13 f.o.b. Leith. These prices would be paid for December delivery. An advance on £13 per ton f.o.b. would now be paid for delivery over the spring months; but the bulk of the Scotch production is already disposed of, and makers are not, in view of the advancing spot market, concerned to make further sales. London makers also are quite off the market. £12 10s. per ton f.o.b. Leith having been paid for July-December delivery, makers now talk of £13 per ton for this position.

Nitrate of Soda.

This article is very firm in all positions, and spot prices are 11s. to 11s. 3d. per cwt., according to quality.

LONDON, *Nov.* 24.

Tar Products.

The demand continues fairly good all round; and prices are well maintained. Further business in 90 per cent. benzol has been done at 10½d. f.o.b. London; while in one instance 10¾d. is reported to have been paid for home consumption. Some 50-90 per cent. has been sold at 9d. per gallon in the North for export, which is a decided improvement on prices which have recently been accepted. Business in toluol is reported at 7½d. in London for early shipment; but consumers decline to pay anything more than this, while as a rule makers ask 8d., which price cannot at present be realized. The position of solvent remains about the same. The demand continues good, and considerable business is reported all over next year for home consumption. Anthracene is quiet; and consumers will not entertain business at the prices asked by manufacturers. The foreign consumers appear to be well supplied, and do not care to purchase just at present. The value of "A" quality may be taken as 1½d. to 1⅝d. per unit for 40-45 per cent.; while "B" quality is absolutely unsaleable. In carbolic acid, the market continues very firm; and the demand is well maintained all round. Further business is reported in 60's at 2s. 3d. per gallon for January-June next year; while as a rule makers ask 2s. 4½d. to 2s. 6d. over this period. The demand is very good, especially for November-December delivery; and it would seem from the anxiety shown by certain dealers to purchase that a considerable quantity has still to be covered in. Crystals are also firmer, and prices as a rule have risen all round. In some instances makers ask as much as 7d. per lb. for 39-40 per cent.; but at present no business is reported at over 6⅝d. to 6½d., although it is difficult to obtain offers from manufacturers at anything like these prices. The market in creosote is quiet; but the demand for export continues fairly good. There are certainly considerable quantities offering in the North of England for both prompt and forward delivery; and lower prices are reported to have been accepted. There is not much offering on the London Market; but the demand for home consumption is certainly not very strong just at present. Pitch continues very firm indeed. London makers have sold at 37s. 6d. net at their works, and, without being anxious to sell, now quote 38s. 6d. For Yorkshire pitch, the demand is still strong. The demand from South Wales continues very good; but consumers will not pay the prices asked by dealers and manufacturers. So far as prompt delivery is concerned, the fuel makers appear fairly well supplied; and so the principal inquiry is therefore for January-June next year.

The average values during the week were: Tar, 18s. 6d. to 22s. Pitch, London, 36s. 6d. to 37s. 6d.; east coast, 35s.; west coast, 33s. to 34s. Benzol, 90 per cent., 10½d.; 50-90 per cent., 8½d. to 9d. Toluol, 7½d. Crude naphtha, 3¼d.; solvent naphtha, 8½d. to 9½d.; heavy naphtha, 10d. to 10½d. Creosote, London, 1⅞d. to 1 15/16d.; North, 1¼d. to 1⅜d. Heavy oils, 2¼d. to 2⅜d. Carbolic acid, 60 per cent., 2s. 2½d. to 2s. 3d. Refined naphthalene, £4 to £9; salts, 20s. to 21s. 6d. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

Sulphate of Ammonia.

This article continues very firm indeed; but it is difficult to fix the exact values at the various ports. The Gaslight and Coke Company decline to offer anything just at present for either prompt or forward delivery; but the nominal quotation may be taken as £13 2s. 6d. for December-January. The South Metropolitan Company are reported to have sold at £13 5s. for December shipment upon their own special terms, which is certainly an improvement on the price ruling last week. In Hull, business was done early in the week at £12 10s. and £12 12s. 6d.; but to-day makers would not accept less than £12 15s. for prompt, while for forward they decline to quote. In Leith, sales were reported early in the week at £12 15s. and £12 17s. 6d. Makers now ask £13 for prompt; while for January-June they decline to quote just at present.

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COAL TRADE REPORTS.

Lancashire Coal Trade.

The severe weather which set in nearly a fortnight ago seems to have come to stay. The effect has been felt on the Coal Exchange—more orders have come in. Stocks, however, are quite sufficient to meet present requirements; and there has been no increase in price. A little more money is asked for slack and burgy, and colliery proprietors contemplate a rise of from 3d. to 6d. per ton on future contracts. Coal for shipment by the Canal goes off very steadily. Notwithstanding the large orders for steam coal from South Wales reported from Russia and Japan, the miners' wages have been reduced 5 per cent.; and while such reduction may not affect the Lancashire miner directly, it does not increase his hopes of a return of his own 5 per cent. loss a little time ago. Furnace coal remains quiet. For gas coal and cannel, there has been a further demand for increased deliveries; and if we are to have what is commonly understood as an "old fashioned winter," it may be that existing contracts will not be sufficient to meet actual requirements. The quotations are: Best house coal 13s. to 14s. per ton at the pit, seconds 11s. to 12s., common 9s. to 10s.; steam and forge coal 8s. to 9s., secondary 7s. 6d. to 8s., lower qualities 4s. 6d. to 5s., best slack 7s. 6d. to 8s., secondary 6s. 6d. to 7s., screened coal for export, delivered at the Manchester Ship Canal, 9s. 3d. to 9s. 9d., unscreened about 6d. less.

Northern Coal Trade.

The coal trade has been a good deal interfered with by the stormy weather, which has limited the shipments and interfered with the transit of the coals from some of the collieries on the one hand, and, on the other, has lessened the stocks; so that now there is a fuller demand. In the steam coal trade, best Northumbrians are quiet at 9s. per ton f.o.b., second-class qualities are 8s. to 8s. 3d., and steam smalls are steady at from 4s. to 4s. 6d. The collieries are now working fairly well, and have orders that will extend into next month. In the gas coal trade, the demand is now about at its fullest; and while it seems to be promptly met—except for the interference that storms make—the prices for the best kinds of Durham gas coals are firm for quantities beyond the contracts. Generally, the quotation is from 7s. 9d. to 8s. 4½d. per ton f.o.b. In the coke trade, the market is firm; but the very large supply of gas coke throws more on the markets. Good gas coke for export is still quoted from 12s. 6d. to 13s. per ton f.o.b.

Scotch Coal Trade.

Except that the severe wintry weather is leading to a strong demand for coal for domestic purposes, the market is unchanged. There is a general quietness, particularly for home consumption; the better demand being, in the meantime, for shipping purposes. The prices quoted are: Main 7s. 3d. to 7s. 6d. per ton f.o.b. Glasgow, ell 8s. to 9s., and splint 8s. 9d. to 9s. The shipments for the week amounted to 228,190 tons—an increase of 3289 tons upon the preceding week, but a decrease of 18,249 tons upon the corresponding week of last year. For the year to date, the total shipments have been 10,402,094 tons—an increase of 352,597 tons upon the corresponding period of last year.

A Water-Gas Plant for Rochdale.—After mature consideration, the Rochdale Gas and Electricity Committee have definitely decided to install a water-gas plant. Previous to this resolution being come to, the Engineer (Mr. T. Banbury Ball) was asked to ascertain whether, by carrying out certain repairs to the existing machinery and buildings, the estimated expenditure of £15,500 on a water-gas plant could be postponed for twelve months. Mr. Ball, however, reported that the necessary repairs and the cost of working after executing them would involve an expenditure of £531 more per year than would be the case if the proposed new plant were installed; and the Committee thereupon came to the conclusion that it would be wiser to put in the water-gas plant, the cost of which will be defrayed from the reserve fund.

Deputations to the Exhibition: A Gas Company's Offer.—Among the items considered by the Normanton Urban District Council at their last meeting was a letter from the local Gas Company offering £10 towards the expenses of a deputation visiting the Gas Exhibition. After considerable discussion, it was decided to write expressing the Council's appreciation of the offer, but declining it, on the ground that if a deputation went to London, it would be in the interests of the ratepayers, and at their expense. Some of the members appeared to think that if the offer was accepted, the Council would be binding themselves to the Company; but it was pointed out that the Company made the proposal because they wished a deputation to see the exhibition for their own information, and not with a view to any increased business. Subsequently a deputation of three was appointed to visit the exhibition; the expenses to be paid by the Council.

Gas v. Electric Light at Ryde.—At the meeting of the Ryde Town Council last Wednesday, the General Purposes Committee recommended that the tender from the Ryde Gas Company be accepted for lighting the large Town Hall and Council Chamber on the following terms: Purchase of eight lamps, large Town Hall, £42 10s.; purchase of two lamps, Council Chamber, £6 10s.; maintenance and upkeep of large hall, 24s. per quarter; do. of Council Chamber, 6s. per quarter. They further recommended that the tender of the Isle of Wight Electric Light and Power Company should be accepted for lighting the small halls for a year at 4d. per unit, and £3 8s. for the hire of wires, lamps, renewals, maintenance, cleaning, &c. Mr. Mears, in proposing this, said the cost of lighting the small hall with gas would be 2d. an hour, and with electric light a fraction under 5d. The cost of lighting the large hall with gas would be 6d. an hour. Under the old arrangement it was 2s. 6d. Mr. Sweetman said he thought they might have electric light in the Council Chamber, whatever the cost; and he moved an amendment to the effect that the chamber should be lighted by electricity. Mr. Weeks, in seconding the amendment, acknowledged that the large hall was splendidly lighted by gas. After some discussion, the amendment was carried by 9 votes to 6.

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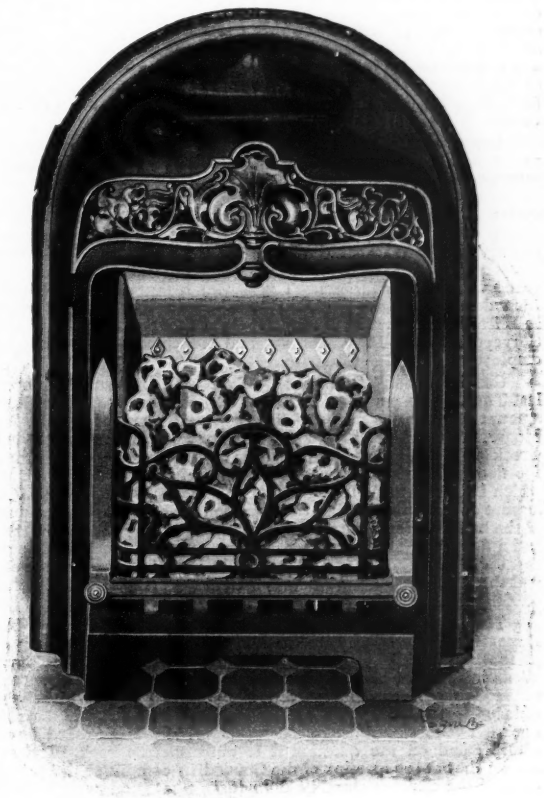

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LONDON, GLASGOW, FALKIRK, &c.

Sale of Shares.—Last Wednesday, 25 fully paid £10 shares in the Littleborough Gas Company were sold by auction. Six of them fetched £25 11s. each, and the rest £25 4s. apiece.

Chertsey Gas Company.—The annual general meeting of this Company was held last Wednesday—Mr. W. Moir in the chair. The profit and loss account showed a net balance of £3225, which was an increase compared with the preceding year; and the Directors in their report recommended that the statutory dividends should be paid, free of income-tax. The report was adopted.

The Dangers of Electric Currents.—Trinity Presbyterian Church, Newcastle-on-Tyne, a fine building erected only eight years ago at a cost of £17,000, was gutted by fire last Friday night. It appears that while electric lighting improvements were being made in the church the wires fused, setting fire to the felting in the roof. The latter became enveloped in flames, and, despite the efforts of the firemen, it fell in. Nothing remains of the main building except the walls and windows.

A Large Purchase by the Imperial Continental Gas Association—The lands and buildings of the Shipbuilding Company known as the Vulcan Belge have been sold to the Imperial Continental Gas Association of London. The purchase, which has been made on behalf of the Association's Antwerp works, has been concluded for £77,000. The shipbuilding works thus acquired are situated at Hoboken and Hemisem; and it is believed that the available land will be utilized for the purpose of extending the Antwerp Gas-Works. This statement was published by a financial paper last week; and we learn that it is substantially correct.

Improved Public Lighting at Bilston.—A scheme has been completed at Bilston which has resulted in the town being lighted in a manner which gives complete satisfaction. No fewer than 410 ordinary gas-lamps in the township have been converted to the incandescent system. The matter was taken in hand by the General Purposes Committee of the Urban District Council about nine months ago, and negotiations were entered into with the Gas Company for carrying out the scheme. At present twice the quantity of light is obtained as compared with the old burners. The system is that of the Anti-Vibration Incandescent Lighting Company, which has been in successful operation in Bilston for about ten years. It was adopted on the suggestion of the Surveyor (Mr. J. P. Wakeford), and the fittings were fixed by the employees of the Gas Company.

Gas Explosion at Southsea.—By a gas explosion which occurred last Thursday morning at 21, West Street, Southsea, damage to the amount of £200 was caused. The house is occupied by Mr. Rupert Moore, an employee of the Portsea Island Gas Company; and the wreck was caused by an escape from an unknown main laid beneath the flooring of the front room, the gas being ignited by a small fire which had been made for a gentleman lodger. The explosion damaged a great deal of property in other parts of the house, as well as portions of the building itself. An escape had been detected earlier in the day, and a fitter had left a short time before the explosion, after doing some repairs to a bracket. The Fire Brigade quenched the burning floors; and the Gas Company afterwards had an examination made into the condition of the mains in the street.

The Price of Gas at Doncaster.—The worthy town councillors of Doncaster do not seem to be quite of one mind on the subject of the price that should be charged for gas. At a meeting of the Council on Wednesday week, Mr. Spencer moved that a minute of the proceedings of the Council in committee, proposing that the price of gas should be reduced from 2s. 6d. to 2s. 4d. per 1000 cubic feet, should be referred back. The motion having been seconded, Mr. Clark asked how they would stand on the question if it were referred back. It was well known that at the meeting of the Council in committee the voting was even on the question; and he did not see what good purpose would be served by referring the matter back. On a vote being taken, the numbers were equal; but the Mayor gave his casting vote in favour of the motion. This hesitancy about making the reduction scarcely accords with the remarks made at the opening of the gas exhibition on the same day, of which an account appeared last week.

The Welsh Water in Birmingham.—In the course of a report on the Elan Valley works which the Water Committee of the Birmingham Corporation will shortly present to the City Council, they state that since the opening of the works there has been a practically continuous flow of water through the aqueduct into the reservoir at Frankley. The actual use of the water in the district commenced on the 17th of September, when it was first sent into distribution. Before this was done, searching bacteriological and chemical tests were applied to the water, which was pronounced satisfactory. The quantity taken into distribution is being steadily increased, and now reaches an average of about 11 million gallons a day, which is practically the amount which can at present be supplied from the Elan Valley. So far the Welsh water has been introduced into the high and middle level zones only. The necessary alterations to bring it into use in the low-level zone cannot be undertaken until the upper levels are placed in a position to be supplied independently. The partial introduction of the gravitation supply has already considerably curtailed the pumping operations.

It is estimated that in lighting the streets of Berlin there are in use 23,215 incandescent burners, against 576 arc and 112 incandescent electric lamps.

The Chemical Engineering Company and Wilton's Patent Furnace Company have received from the Wexford Gas Consumers' Company an order for one of their round open saturators.

A successful demonstration with the "Minimax" hand fire extinguisher, which has already been referred to in our columns, recently took place at the Guildford Gas-Works, where its qualities were tested on a shed saturated with oil and tar, and also on a pool of tar, which were respectively set ablaze and brought under control with remarkable rapidity. The experiments were witnessed by (among others) Messrs. W. Baker, J.P., the Chairman of the Gas Company, W. Titley, the Secretary, and G. R. Love, the Manager.

THREE POINTS

of advantage from the many found in our Slot Meters are:

1st.—They are Fraud Proof, and Cannot be tampered with through the Slot.

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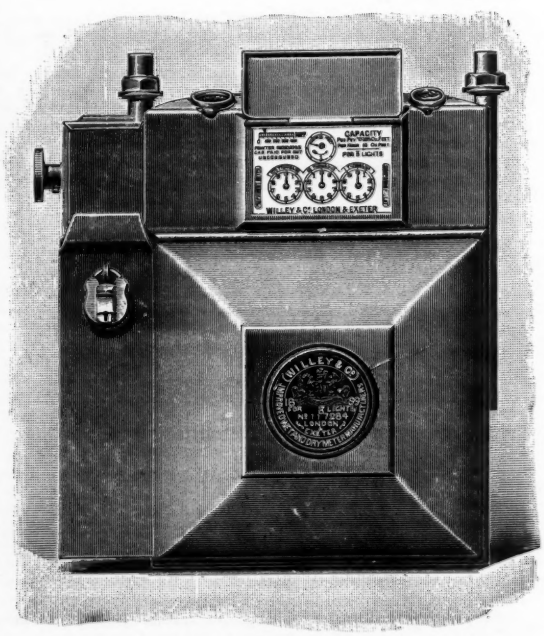

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Tens of Thousands in use, and adopted exclusively by many Gas Companies.

WILLEY & CO., LTD., LONDON & EXETER.

Do not fail to visit our STAND, No. 58, at the International Gas Exhibition, Earl's Court, W., Nov. 19 to Dec. 17.

The Glyncorrwg Urban District Council have placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for a regenerator setting on Waddell's patent regenerative system.

Messrs. George Bray and Co., Limited, of Leeds, have sent us a copy of their new season's catalogue of incandescent gas lighting appliances. The various lanterns, burners, &c., are very neatly and effectively printed, and are accompanied by their net prices.

The Wandsworth Borough Council rejected last Wednesday an offer by the County of London Electric Supply Company, Limited, to supply current for street lighting at 2d. per unit. A Committee which had gone into the matter reported that electricity at this rate would cost three times the amount now spent on gas.

A widow living in Hull was last week discovered in her bedroom dead, with a rubber gas-pipe attached to the bracket in her mouth. The medical evidence at the inquest showed that death was due to asphyxia caused by the inhaling of coal gas; and the Jury returned a verdict of "Suicide whilst of unsound mind."

With reference to the contracts for the second line of pipes connecting Thirlmere with Manchester, described in the "JOURNAL" for the 15th inst., it should be mentioned that the welded pipes and the special flange collars illustrated in the article were supplied by Messrs. Thomas Piggott and Co., Limited, of the Atlas Works, Birmingham. This firm supplied the steel pipes for the Birmingham, Bradford, and other large water-works schemes.

Drakes, Limited, of Halifax and Leeds, are sending out a profusely illustrated catalogue showing the various kinds of gas-works plant manufactured and erected by them. The particulars furnished occupy 110 pages, and reference to them is facilitated by an index. The extent to which the firm's patent tubular regenerator furnaces have been adopted in the course of nine years is strikingly shown by a diagram and the list of towns by which it is backed.

Under the title of "La Lumière Moderne, Limited," a company has been registered with a capital of £60,000, in £1 shares, to manufacture and deal in incandescent mantles, lamps, &c.

The German-Austrian Mannesmann Tube-Works close the business year 1903-4 with a total gross profit of 4,148,893 marks, against 3,302,113 marks in the preceding year. After deducting 1,520,552 marks for general expenses, 214,167 marks for interest on obligations, and 1,214,976 marks for writings-off, a net profit (including the profit of the German works to the amount of 19,757 marks) of 1,218,955 marks remains. This is devoted to lessening the deficit, which is thereby reduced to 4,523,639 marks. The output figures were higher than those of any preceding year by 12,946 tons; and the value of the returns rose by 4,249,000 to 20,055,000 marks.

A replica of the wheel with which His Majesty turned the water into the aqueduct from the Elan filters of the Birmingham Water-Works in July is now on exhibition at the Art Gallery. The original was presented to the King by the Engineers. The wheel has a flat surface with rich side mouldings, delicately turned, and has four spokes with projecting handles in line with them, somewhat after the style of the mariner's wheel. These handles have fluted ornament, and the Royal Crown and monogram below it. Two monograms are those of the King, "E.R.," and the Queen, "A.R." The four spokes of the wheel are made use of to give in raised letters the names of those who were most prominently concerned in the work of bringing Welsh water to Birmingham—viz., "Hallewell Rogers, Lord Mayor; Edward Lawley Parker, Chairman of Water Committee; Edward Orford Smith, Town Clerk; James Mansergh and Sons, Engineers." The flat surface bears the following inscription, "Birmingham Corporation Water-Works Elan Supply, Inaugurated by their Most Gracious Majesties King Edward VII. and Queen Alexandra at the Elan Valley, July 21st, 1904."

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

ENGINEER AND MANAGER. Ceará Gas Company.
MANAGER (AMERICA). No. 4287.
WORKING MANAGER. New Hedon Gas and Coke Company. Application by Dec. 2.
DISTRIBUTION AND MAINTENANCE DEPARTMENT. Great Yarmouth Gas Company.
MECHANIC USED TO ENGINE AND EXHAUSTER, &c. No. 4302.
WORKING FOREMAN. No. 4299.
CLERK. No. 4300.
JUNIOR CLERK. No. 4301.
SERVICE LAYERS. Winchester Water and Gas Company.

Apprentice Wanted.

GILBERT LITTLE AND SONS, Smethwick.

Plant for Sale.

PUMPING ENGINE AND WELL PUMP. Birmingham Water Department.

Purifying Water from Sulphate Still. Particulars Required. No. 4295.

Stocks and Shares.

BROMLEY GAS COMPANY. Dec. 7.
SOUTH ESSEX WATER COMPANY. Dec. 5.

TENDERS FOR

Coke.

ASHFORD (KENT) GAS DEPARTMENT.
KINGSTON-ON-THAMES CORPORATION. Tenders by Dec. 6.

Fire-Clay Goods.

ACCRINGTON GAS DEPARTMENT. Tenders by Dec. 7.

Tar and Ammoniacal Liquor.

BRIDGEWATER COLLIERIES COKE WORKS. Tenders by Dec. 19.
SHOTLEY BRIDGE AND CONSETT GAS COMPANY. Tenders by Dec. 8.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
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HYDRATED OXIDE OF IRON.

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Gives no Back Pressure.
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Offices: Commercial Buildings, LEEDS.
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THE Vacancies for Gas Fitters at the Ilford Gas-Works have been FILLED, and the APPLICANTS are THANKED.

APPLICANTS for the Position of DRAUGHTSMAN in a Large Suburban Gas Company, advertised under No. 4291, are THANKED and informed that the post has been FILLED UP.

WANTED, immediately after Christmas, good SERVICE LAYERS.
Apply, in writing, giving full Particulars of Experience and Reference to present employers, to the WINCHESTER WATER AND GAS COMPANY, Staple Garden, WINCHESTER.

WANTED, Working Foreman for Gas-Meter Works. Must be well up in the Manufacture of Wet and Dry Gas Meters, Brasswork, &c.
Apply, by letter, stating Age, Experience, Wages required, References, &c., to No. 4299, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Great Yarmouth Gas Company, an ENERGETIC MAN to work under the Superintendence of the Distribution Department, and to undertake Maintenance of Incandescent Burners, to visit Consumers, and to advise as to the best methods of using Gas.
Applicants must be Experienced in all modern types of Incandescent Burners, Cooking, and Heating Stoves.
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ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

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WANTED by a Provincial Gas Company, a CLERK accustomed to the general routine of a Gas Office. Salary £100 a Year.
Apply, by letter, giving References only, Age and Experience, to No. 4330, care of Mr. King, 11, Bolt Court, FLEET STREET E.C.

WANTED, a Man thoroughly Experienced in the Use and Management of Inclined Retorts, Cyanogen and Naphthalene Extraction Processes, &c., to Take Charge of Works in America. Good position to right party. Man must be active and energetic.
Address, stating Age, Experience, References, and Salary expected, to No. 4287, care of Mr. King, 11, Bolt Court, Fleet Street, LONDON, E.C.

WANTED, at once, a smart intelligent young Man as JUNIOR CLERK in Gas Offices, West of England. Must have had experience in the keeping of Gas-Works books on the latest system. One with a knowledge of Shorthand and Fitting trade preferred.
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WANTED, at once, in a Gas-Works in the West of England, a good MECHANIC, used to Engines, Exhausters, Pumps, Boilers, &c. One experienced in the manufacture of Carburetted Water Gas preferred.
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GILBERT LITTLE AND SONS, LIMITED, SMETHWICK.

ANY Gentleman who has a son, a skilled trained Engineer, or a son whom he wishes (during his apprenticeship) to be trained in all the departments—viz., the Drawing-Office, Pattern Shop, Turning Shop, Fitting Bench, and outside Erecting Work—is invited to communicate with the above.

THE Ceara Gas Company, Limited, require an ENGINEER and MANAGER for the Company's Works at Ceara, in the North of Brazil.
Applicants must possess a thorough knowledge of Gas Manufacture and Accounts. A knowledge of the Portuguese or French language would be desirable.
Salary £400 per annum, and 5 per cent. on net profits. House on Works provided, also Coals and Gas. First-Class passage out and home at conclusion of agreement. Half Salary on voyage.
Apply, by letter only, sending *copies* of Two recent Testimonials (which will not be returned), to the CEARA GAS COMPANY, LIMITED, 9, Queen Street Place, LONDON, E.C.

THE NEW HEDON GAS AND COKE COMPANY LIMITED.

THE Directors of the above Company require the services of a WORKING MANAGER for the Gas-Works at Hedon, near Hull.
Applicants must be able to take full charge of the Gas-Works, the laying of Mains and Services, reading the Meters, and the attention to and fitting of Incandescent and other lights. Make of Gas about 3 Millions. Wages 30s. per week, with House, Coals, and Gas.
Applications, marked "Working Manager," stating Age, &c., must be sent to the undersigned not later than December 2.
E. BELL,
Secretary.
Gas-Works, Hedon, near Hull.

ANYONE able to supply details of a COMMERCIALLY SUCCESSFUL method for purifying the Waste Gas Water from a Sulphate Still will find it to his advantage to communicate with No. 4295, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

NEW Gasholder, 40 ft. diameter by 12 ft. deep, with Steel Standards; also new STEEL TANK to contain same.
Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

"DEMPSTER'S" Direct-Acting Reciprocating Pumps, Exhausters, and Steam-Engine Combined. Two Sets, 8-inch and 12-inch Connections. Overhauled and Guaranteed. Cheap. Room wanted.
FIRTH BLAKELEY & Co., Gas Engineers, DEWSBURY.

WATER-Works Pumping Engine for SALE. Modern Compound Surface Condensing PUMPING ENGINE and WELL PUMPS, for a depth of 200 feet. Engine Cylinders 25 in. and 54 in., by 5 ft. Stroke, Pump 24-inches diameter. Steel Rising Main, with Lowering Rods and Screws.
Further Particulars and order to view to be obtained from the SECRETARY, Corporation Water Offices, BIRMINGHAM.

ASHFORD (KENT) URBAN DISTRICT COUNCIL.

THE above Council are prepared to receive TENDERS for the surplus COKE (about 1600 Tons) made on their Gas-Works during the Twelve Months from Feb. 1, 1905, to Jan. 31, 1906.
Particulars and Form of Tender may be obtained from Mr. John Morton, the Manager, at the Works.
JOHN CREERY,
Clerk to the Council.
Nov. 18, 1904.

BOROUGH OF KINGSTON-UPON-THAMES.

SUPPLY OF COKE OR CLINKERS.

THE Corporation of Kingston-upon-Thames invite TENDERS for the supply of 6000 cubic yards (more or less) of good small COKE or good CLINKERS, free from dust, the same to be delivered carriage paid and unloaded on the land adjoining the Sewage Works where required by the Borough Surveyor.
The Contractor is to state in his Tender where samples of the material tendered for can be seen.
As the Corporation possess a Destructor they do not invite Tenders for Destructor Clinker.
The Coke or Clinkers are intended for the purpose of the filtration of sewage effluent.
Separate prices to be stated for the Coke and the Clinkers, and a Tender for either of these materials may be accepted separately.
Sealed Tenders, endorsed "Filtering Materials," to be delivered at this Office not later than Monday, the 6th prox.
The lowest or any Tender will not necessarily be accepted.
HAROLD A. WINSER,
Town Clerk.
Town Clerk's Office,
Kingston-upon-Thames,
Nov. 18, 1904.

ACCRINGTON DISTRICT GAS AND WATER BOARD.

THIS Board is prepared to receive Tenders for FIRECLAY RETORTS and FIRE-BRICKS. Retorts: 32 20-feet long for Great Harwood Works, and 42 9 ft. 8 in. for Accrington Works. Fire Bricks: About 20,000.
Tenders, endorsed, to be in my hands on or before Wednesday, the 7th of December.
CHARLES HARRISON,
General Manager.
General Offices of the Board,
St. James' Street, Accrington, Nov. 19, 1904.

SHOTLEY BRIDGE AND CONSETT DISTRICT GAS COMPANY.

TENDER FOR TAR.

THE Directors of this Company invite TENDERS for the purchase of the TAR to be produced at their Works for the Year 1905. Quantity about 70,000 Gallons. The Contractor to find his own Casks and to accept delivery at Blackhill Station.
Tenders to be sent to the undersigned not later than Thursday, Dec. 8.
M. RICHLEY, Secretary.
Gas Office, Shotley Bridge,
Nov. 26, 1904.

BRIDGEWATER COLLIERIES COKE WORKS.
(THE EARL OF ELLESMERE).

TENDERS are invited for the Tar produced at the above Works for a period of Six or Twelve Months from the 1st of January, 1905, delivered into Contractor's Tanks at the Bridgewater Colliery siding, Warton Hall, on the Pendleton and Hindley branch of the Lancashire and Yorkshire Railway; or at the Brackley siding, Little Hulton Mineral branch of the London and North Western Railway.
The estimated quantity is 2500 Tons per annum.
Tenders, endorsed "Tender for Tar," to be addressed to Mr. Thomas M. Brown, Bridgewater Coal Offices, 4, Chapel Walks, Manchester, on or before the 19th of December.
Manchester, Nov. 19, 1904.

BROMLEY GAS CONSUMERS' COMPANY.

ISSUE OF THREE-AND-A-HALF PER CENT. DEBENTURE STOCK.

SALE BY TENDER.

THE Directors Invite Tenders for £8000, of Debenture Stock authorized to be raised under the Bromley Gas Acts, 1865, 1879, and 1902, which will bear a fixed and perpetual preferential rate of Interest of £3 10s. per cent. per annum, payable Half-Yearly (subject to Income-Tax). Allotments to the Highest Bidders.
Tenders must be delivered on or before Wednesday, the 7th day of December, 1904.
Forms of Tender, with Particulars and Conditions, may be obtained on application to the Secretary, at the Company's Offices, 156, High Street, Bromley, Kent, or from the Company's Bankers, Messrs. Robarts, Lubbock, and Co., 15, Lombard Street, London, E.C.
By order of the Directors,
HENRY WILLIAM AMOS,
Secretary.
Bromley, Kent, Nov. 18, 1904.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES 18, FINSBURY CIRCUS, E.C.

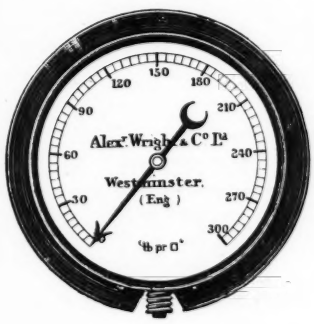
By order of the Directors of the
SOUTH ESSEX WATER-WORKS COMPANY.

NEW ISSUE OF £5000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK AND £5000 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, Dec. 5, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

STEAM, OIL, and WATER.



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PATENT RECUPERATIVE
INCANDESCENT GAS LAMP.

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MANY DETAIL IMPROVEMENTS.

This Burner being positively Dust and Draught Proof, it prolongs the life of the Mantle and Saves its Cost in Maintenance.

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PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

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Above the Average in Weight and Quality of Coke.
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The very best to adopt for Productive Capacity, Economy of Fuel, Durability, and Simplicity of Management.

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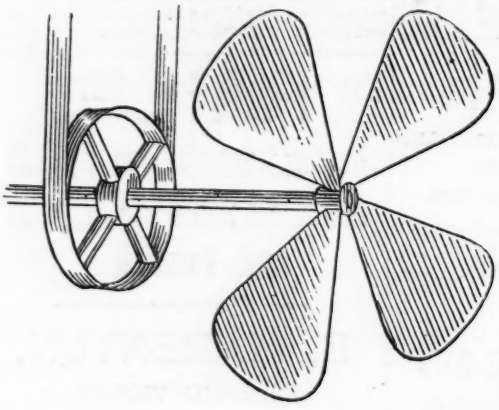

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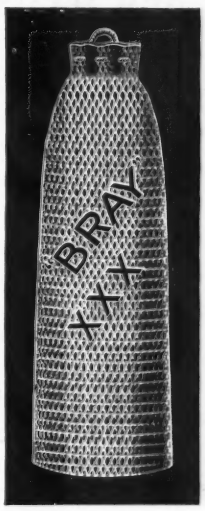

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THE Inventions enumerated below are valuable and worthy of the careful attention of all firms who desire to keep pace with the times with their plant. The Patent Rights are either for Sale outright, or may be worked on Licence, or we will on reasonable terms agree to their being manufactured and supplied by a Company to be formed for that object.

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Note.—We are prepared to supply this Primary Cleanser without direct charge, taking payment by results and savings over an agreed period.

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We intend to be in attendance, with models and drawings of the above, at a convenient address near to Earl's Court during the latter part of the Exhibition, and meantime invite all interested parties to communicate with us, as below, when we shall be pleased to arrange an appointment to inspect same with a view to business.

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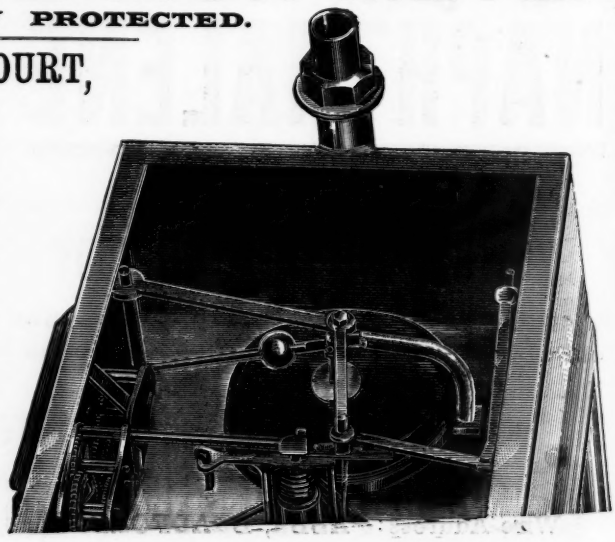

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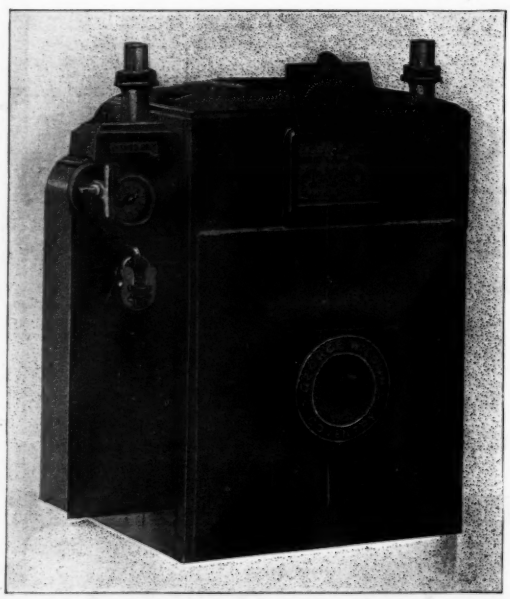

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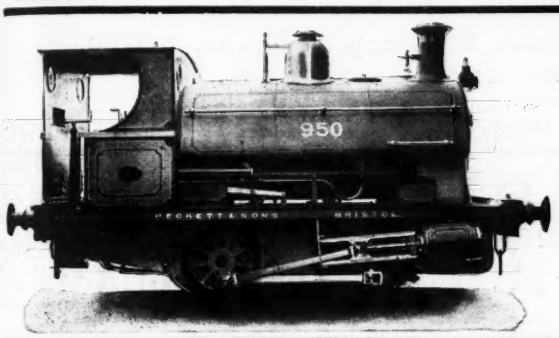

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Clear Domestic Chimneys,	19s.
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New Polished Brass Outside Air Cone for use with above improves the appearance of Burner and increases the light by 25%. Easily fixed to existing Burners without injury to Mantles, **4/6** per gross. G.I.C. Heavy "C" Burner with real steatite ring, **59/-** per gross.

N.B.—All our Glass is about 10% cheaper when taken in original cases, and we pay carriage to your works.

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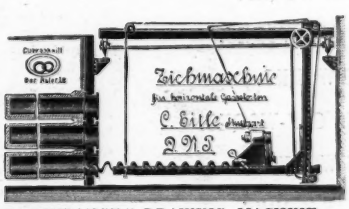

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5.—Least inrush of cold air owing to the close fit of the charging mouthpiece with the retort mouthpiece, with consequently practically no cooling of the retort, the least outrush of flame and smoke, and therefore smallest loss of gas.
6.—Smallest consumption of power.
7.—Most rapid working, as the complete charging of a retort requires only two pulls of a lever.
8.—May be set at any position in regard to height by either manual or motor power.
9.—Lowest cost to purchase; paying interest and redemption in about three years.

ADVANTAGES OF THE "SCHLANGE" DRAWING MACHINE

1.—The simplest and best drawing machine in the world for horizontal retorts.
2.—Least time required to draw a retort (10-15 seconds).
3.—Most careful treatment of the lumps of coke, as well as the retort.
4.—Smallest consumption of power.
5.—Lowest cost to purchase.
6.—Most substantial construction, and consequently very low maintenance charges.
7.—Rapid and cheap working, consequently pays interest and redemption in a few years.

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ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·20.

VERY FREE FROM IMPURITIES.

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PRICE LISTS ON APPLICATION.

W. J. JENKINS & CO., LIMITED, RETFORD,

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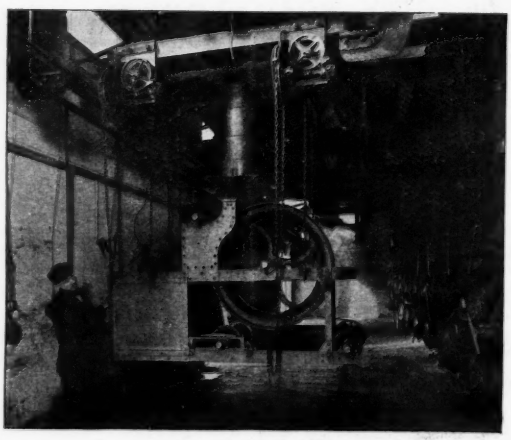

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The D.B. Patent Coal Projector as Installed at the Derby Gas-Works.

21 INSTALLATIONS AT WORK & ON ORDER.

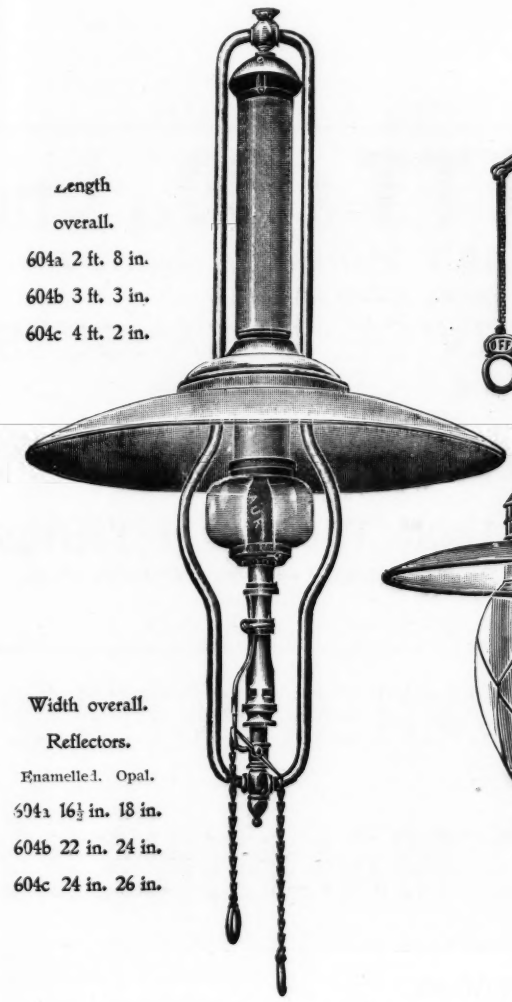
See our STAND at Earl's Court Exhibition.

The Welsbach·Kern (Patent)

Self-Intensifying Lamps.

Length overall.
604a 2 ft. 8 in.
604b 3 ft. 3 in.
604c 4 ft. 2 in.

Width overall.
Reflectors.
Enamelled. Opal.
604a 16½ in. 18 in.
604b 22 in. 24 in.
604c 24 in. 26 in.



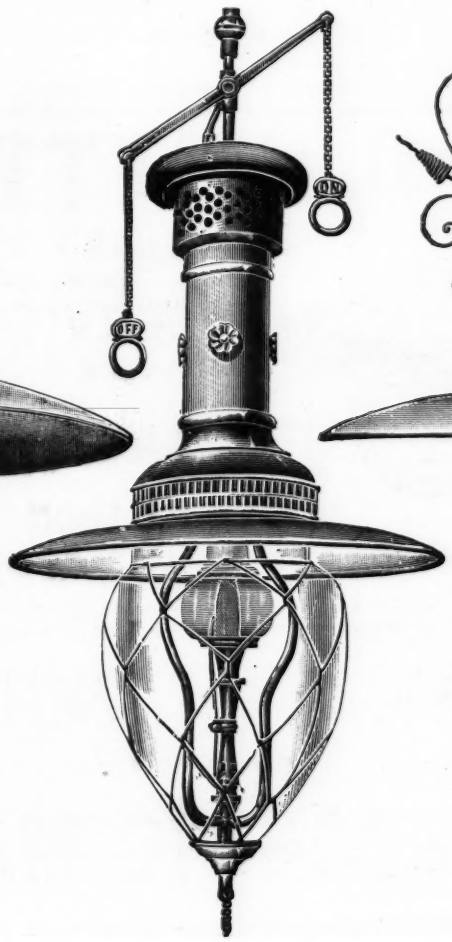
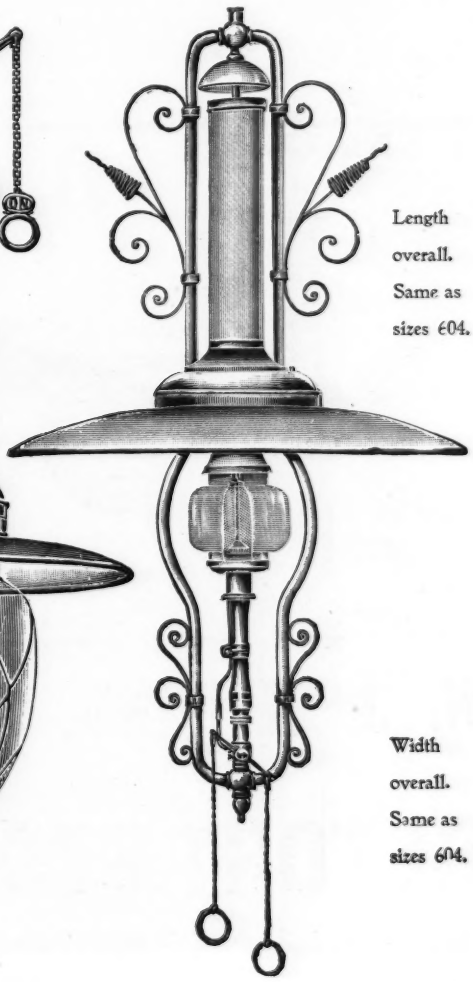


Fig. 607.



Length overall. Same as sizes 604.

Width overall. Same as sizes 604.

Fig. 604.

Interior Lighting. Enamelled.
A 5 ft. per hour, 150 c.p., £1 13 0
B 10 ft. „ 300 c.p., 2 8 0
C 20 ft. „ 600 c.p., 4 4 0

Overall.	Length.	Width.
607b	4 ft. 4 in.	24 in.
607c	5 ft. 0 in.	29 in.

Storm Proof Arc. Enamelled Reflector, Cup and Ball Joint, Lever Tap and By-pass.
607b 10 ft. per hour, 300 c.p. £5 0 0
607c 20 ft. „ 600 c.p. 7 10 0

Fig. 605.

Interior Lighting (Ornamental).
605a 5 ft. per hour, 150 c.p., £2 5 0
605b 10 ft. „ 300 c.p., 3 1 6
605c 20 ft. „ 600 c.p., 5 0 0

SUBJECT TO OUR USUAL TRADE DISCOUNT.

The Welsbach Incandescent Gas Light Co., Ltd.

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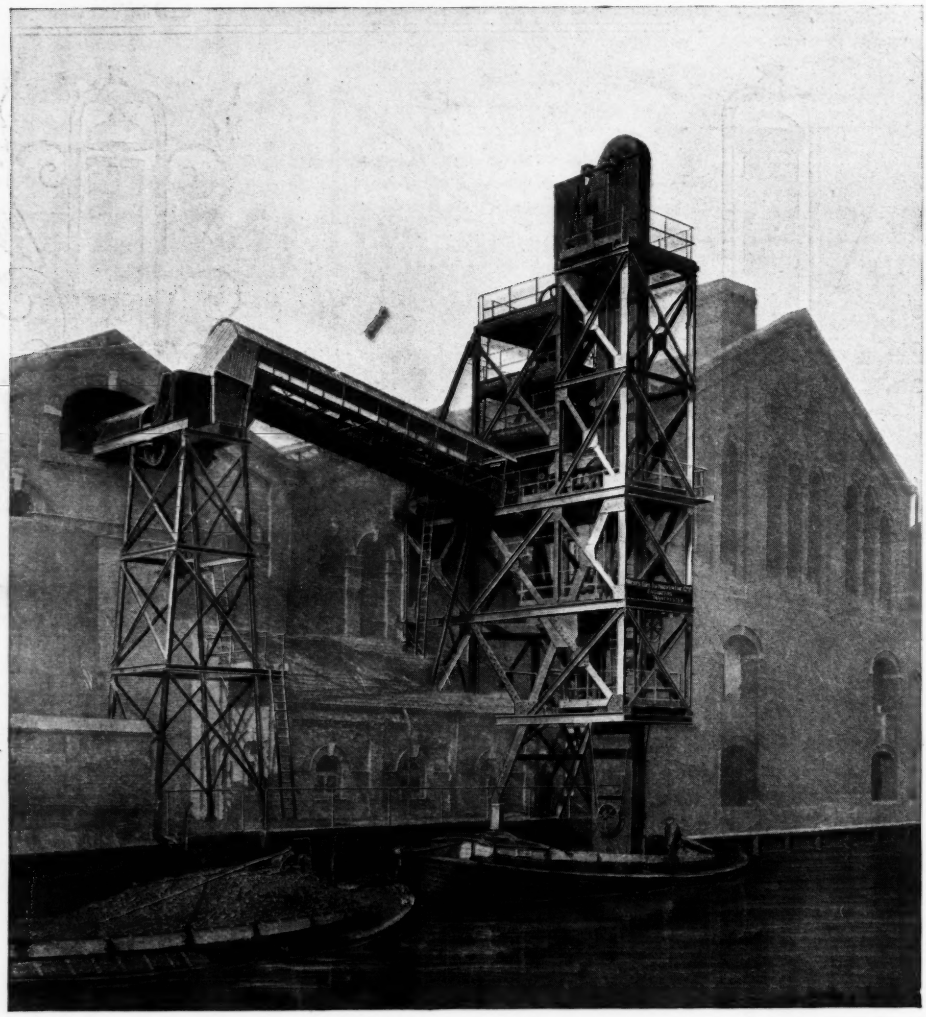

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BRITISH MANUFACTURE.

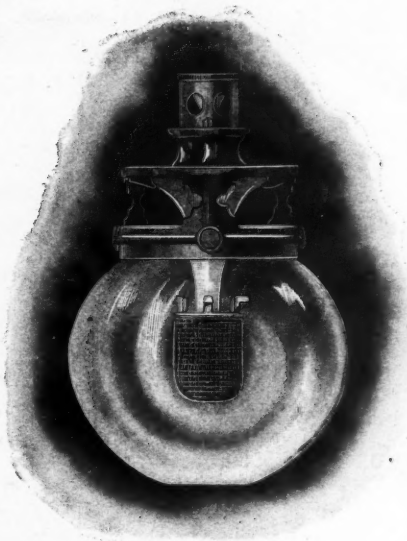
INCREASED DISCOUNTS TO THE TRADE.

New types of BURNERS at popular Prices.

MAXIMUM LIGHT WITH MINIMUM CONSUMPTION OF GAS.

The "Bijou" Burner in clusters for interior lighting has the decorative effect of Electric light at One-Eighth the cost.

NEW LISTS NOW READY.



No. 2 Burner only, in Polished Brass or Steel Bronze, 4s. 6d. Globes from 6d. each. Mantles 7s. per dozen.

No. 3 Bijou" Burner only, in Polished Brass or Steel Bronze, 3s. Globes from 4d. each. Mantles 6s. 6d. per dozen.

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We are Exhibiting at the International Gas Exhibition, Earl's Court, W., Nov. 19 to Dec. 17, at STAND No. 60. A visit will be esteemed.

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APPLICABLE TO EVERY KIND OF PURIFIER.

This System is in successful operation at a very large number of important Gas-Works on the Continent, and orders have been received from English Engineers as follows:—

			ft.		ft.		ft.	in.
CHESTER	1	Purifier	24	×	22	×	5	3
CHESTER 2nd Order	1	,,	24	×	22	×	5	3
ROCHESTER	4	,,	20	×	20	×	5	6
ROCHESTER 2nd Order	2	,,	24	×	20	×	5	0
SOUTHEND	2	,,	20	×	15	×	4	6
HULL	2	,,	20	×	20	×	5	0
BRENTFORD	1	,,	20	×	30	×	7	0
WINCHESTER	4	,,	15	×	15	×	6	0
CAGLIARI	4	,,	10	×	10	×	4	0
HALSTEAD	4	,,	9	×	9	×	5	0
DEAL	1	,,	10	×	10	×	4	6
LEAMINGTON	1	,,	20	×	20	×	5	0
OLDHAM	4	,,	20	×	20	×	4	0

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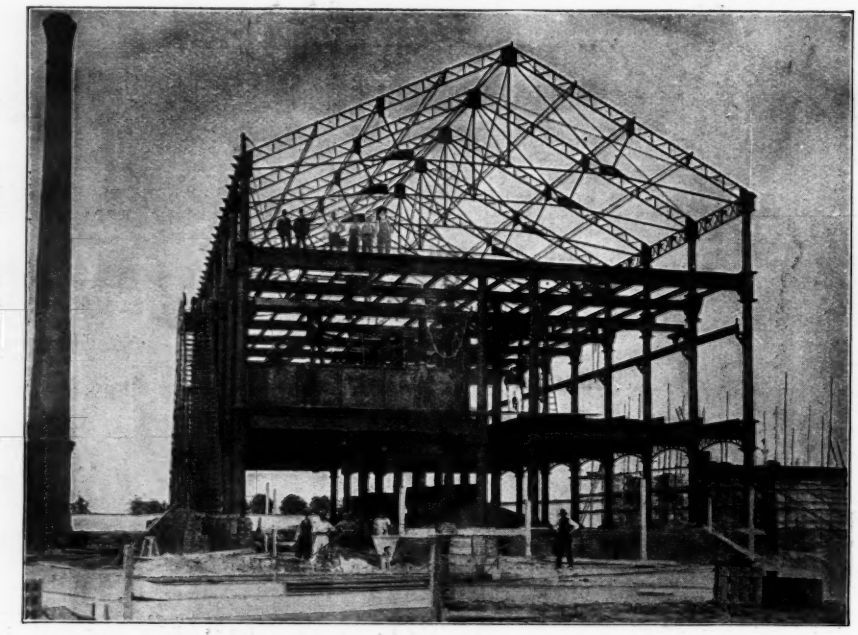

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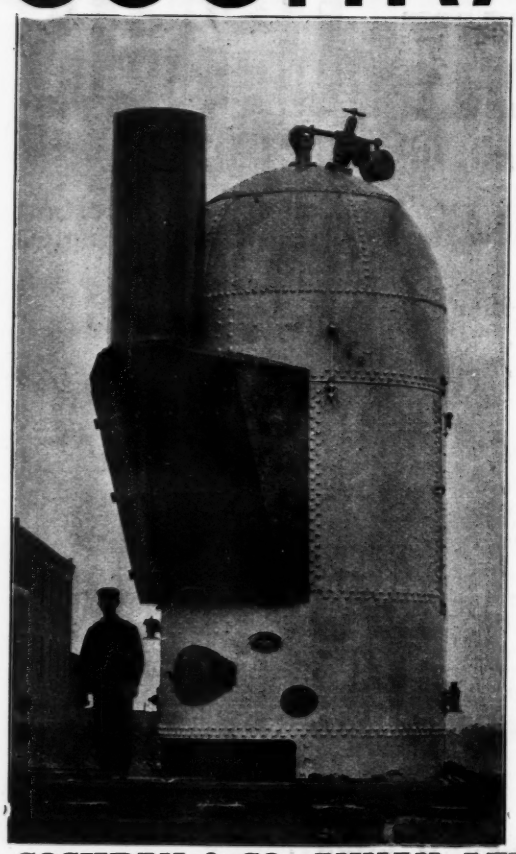

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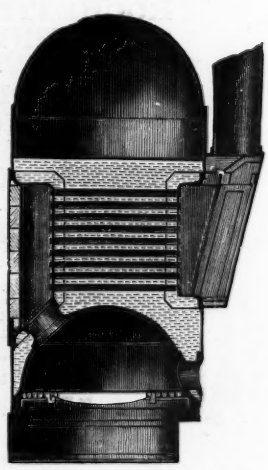

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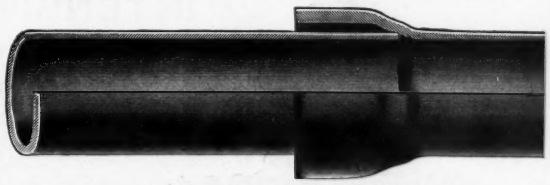

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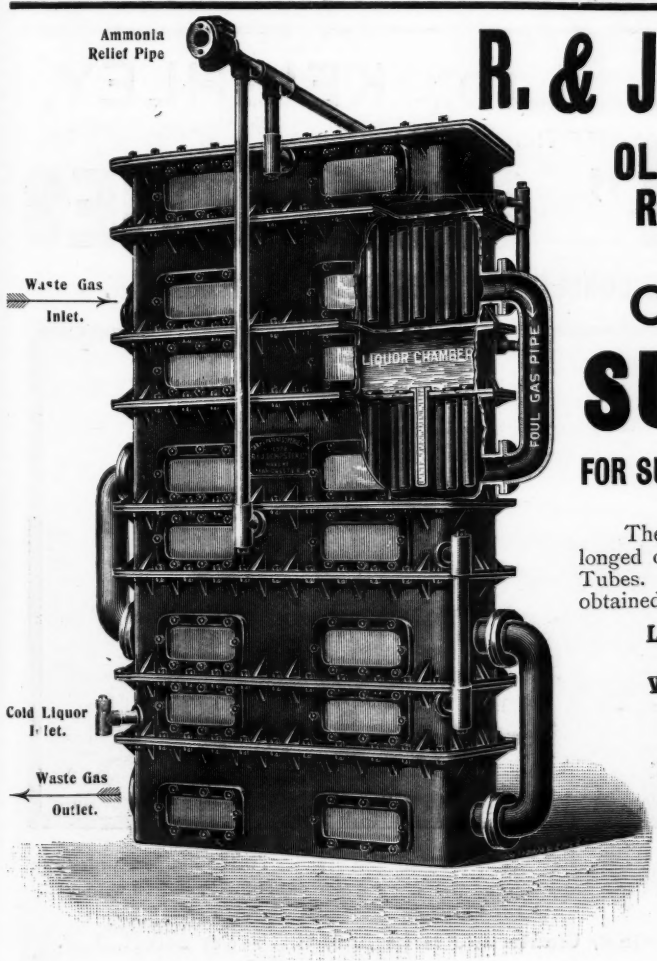

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SUPERHEATER
FOR SULPHATE OF AMMONIA OR OTHER PLANTS.

The rectangular shape of this Superheater effects a prolonged contact of the waste heat with the depending Liquor Tubes. In Superheaters at work the following efficiency is obtained:—

Liquor Inlet to Superheater ..	64° F.
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STEAM AND FUEL ARE SAVED;
THE CAPACITY OF THE PLANT IS INCREASED;
THE CHEAPEST UNREFINED ACID CAN BE USED;
AND LESS CONDENSING POWER IS REQUIRED.

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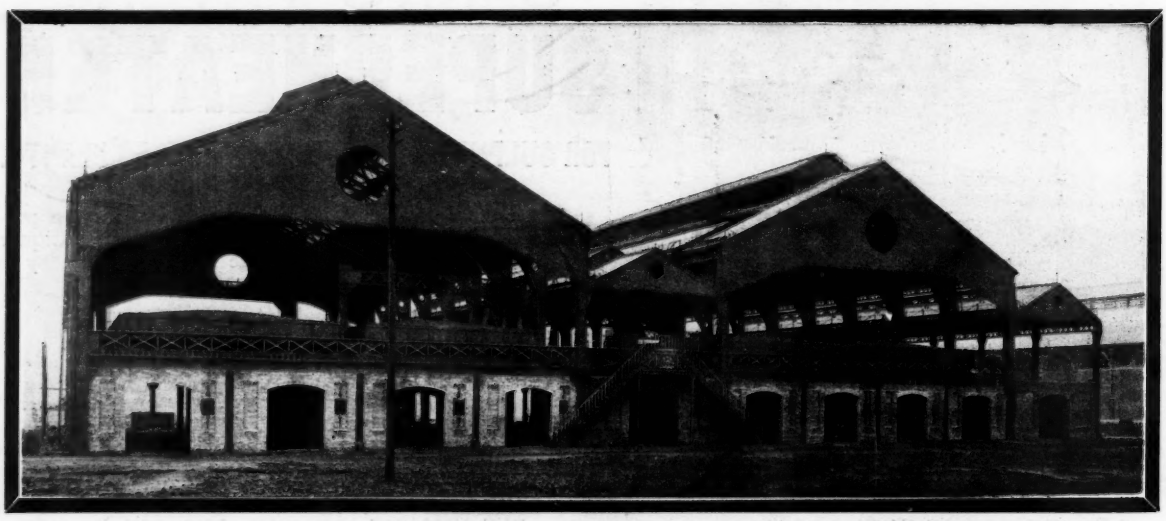

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